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Railway Mechanical Engineer

August 1947

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UNIT-EQUIPPED CARS AT THE TRACK EXIBIT—ATLANTIC CITY CONVENTION

RAILWAY MECHANICAL ENGINEER

With which is incorporated the RAILWAY ELECTRICAL ENGINEER

(Names Registered, U. S. Patent Office)

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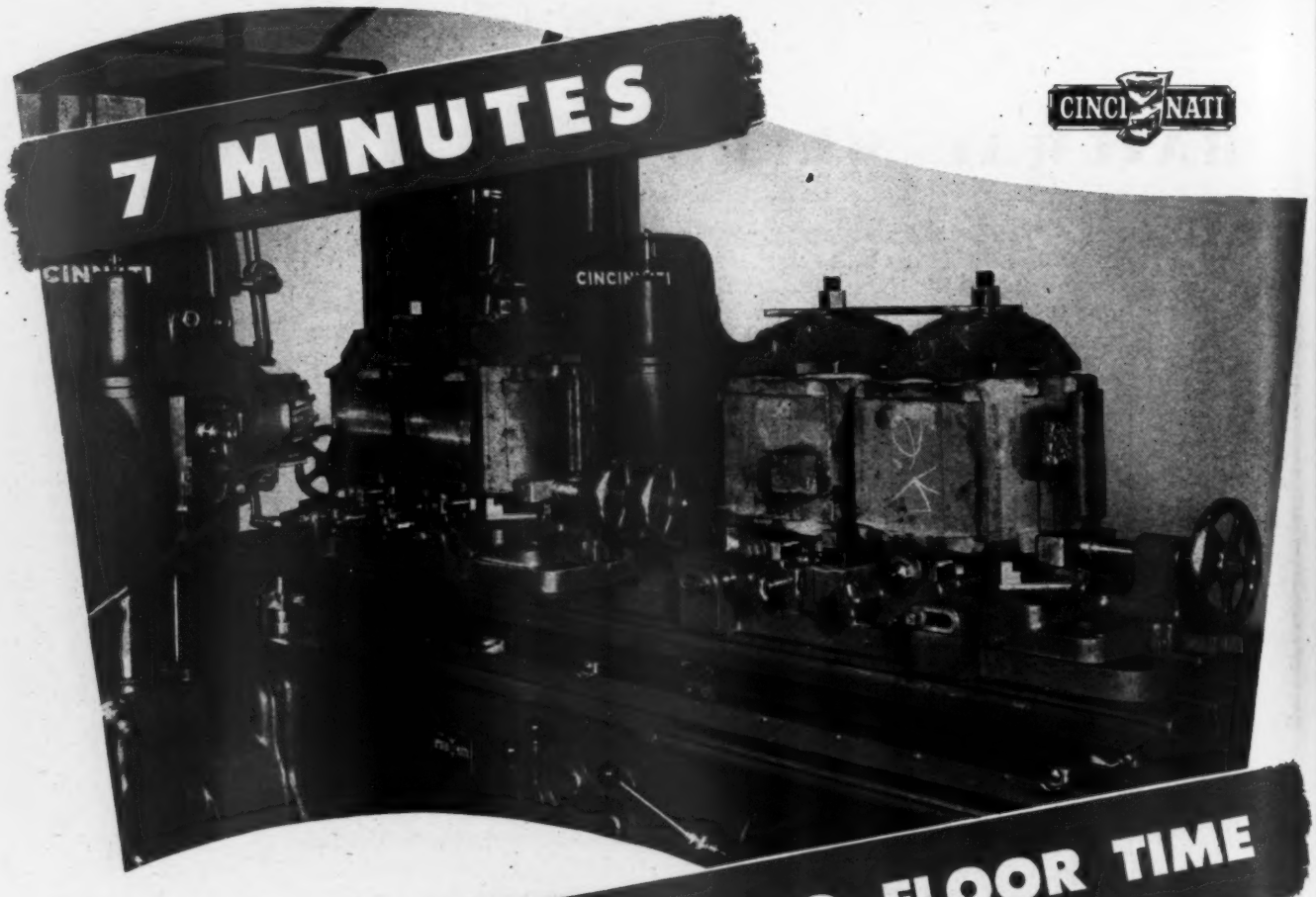
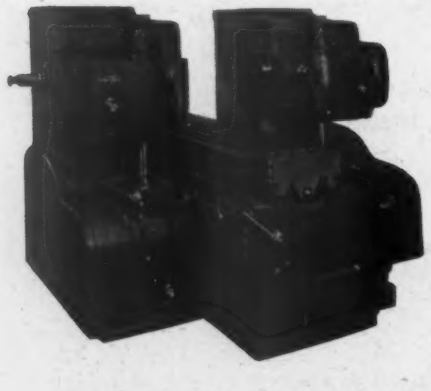


Milling the channels in journal boxes on a CINCINNATI No. 56-90 Duplex Hydromatic with extra features for railroad shops.

FLOOR-TO-FLOOR TIME ... Duplex Milling the Channels in Journal Boxes



CINCINNATI No. 4-48 Duplex Hydromatic Milling Machine. Also built in plain style; 12 sizes of each from 24" to 90" table travel.

The CINCINNATI Hydromatic illustrated here mills the channels in both sides of cast steel journal boxes, taking a cut about 9" wide by 12½" long, averaging ⅜" deep. Two-way feed cycle and 90" table travel permits the use of two sets of fixtures. While two parts are being milled, the operator has plenty of time to reload the other two fixtures. The face mills are 9" diameter, and take the entire width of cut in one pass. ¶ CINCINNATI Hydromatics have ample power for work of this type; up to 50 hp in the larger sizes, if desired. And to keep down the cost of milling small quantities, Hydromatics may be equipped with quick setup features for railroad work, like the one in the illustration. It has verniers and scales for the spindle carriers and quills; quick clamping device for quills; counterweights for spindle carriers. ¶ Other features of CINCINNATI Hydromatics are equally important in railroad shops. Would you like to know more about them? Write for catalog M-1372-1 which contains complete specifications.

See the CINCINNATI MILLING DISPLAY at the MACHINE TOOL SHOW, Booth No. 306 Chicago, Sept. 17-26

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General Motors Presents

The "Train of Tomorrow"

Four cars, built by Pullman-Standard, incorporate Astra Dome in each; self-contained power plants; outside swing hanger trucks; an electric diner; radio communication

ONE of the most spectacular recent developments in the railway passenger equipment field is the General Motors "Train of Tomorrow" which features an Astra-Dome in each of four cars, including a chair car, diner, sleeper and lounge car. The train, powered with an Electro-Motive 2,000-hp. Diesel locomotive, made a press run on the Monon from Chicago to French Lick, Ind., and return late in May, was exhibited at the Atlantic City, N. J., convention in the latter part of June, and will be exhibited at various cities throughout the country in the next few months. Following this exhibition tour, it is expected that the train will be purchased and placed in regular passenger service by some Class I railroad.

The central idea of this train originated with General Motors in 1944 and subsequent practical suggestions from railway officers and transportation experts were combined in a four-car Astra-Dome train. Electro-Motive engineers worked in conjunction with the General Motors styling section and engineers of the Pullman-Standard Car Manufacturing Company, which developed detail engineering designs and built the cars.

In addition to the Astra Domes—30 ft. long—special features of the train include air-conditioning equipment throughout, furnished by the G. M. Frigidaire Division, anti-friction journal-box bearings supplied by the Hyatt Bearings Division and electric generating equipment for all car lighting and power purposes supplied by the Detroit Diesel and the Delco Products Division of General Motors. The latter equipment provides an independent Diesel-electric power supply* on each car. An additional 40-kw. power unit is required on the all-electric diner.

The trucks are designed with outside swing-hanger suspension, an Electro-Motive development which tends to minimize side sway. The truck wheels were dynamically balanced on a Bear No. 400 machine at 325 r.p.m., necessary material being removed at required spots by air grinders held by hand.

The train is equipped with electro-pneumatic brakes and wheel slide control, also hot bearing detectors.

All cars include Rador train-heating and temperature-control equipment, and extensive use is made of fluorescent lighting and fixtures of unusual design.

The E-M 2,000-hp. Diesel locomotive is 71 ft. long and has a loaded weight of 318,000 lb. Each of the cars is 85 ft. long. The chair car has a light weight of 147,000 lb. and a seating capacity of 72, including the Astra-Dome. The dining car has a light weight of 160,000 lb. and seating capacity of 52, including 18 in the Astra-Dome and 10 in the private dining room. The total refrigeration space supplied in this car is 111 cu. ft., and ice making capacity 225 lb. of ice cubes in 24 hr.

The sleeping car has a light weight of 150,000 lb. and

* Described in more detail on page 434 of this issue.

passenger capacity of 24 sitting and 20 sleeping, exclusive of 24 seats in the Astra-Dome. This car is designed with two three-berth drawing rooms, three two-berth compartments, and eight duplex roomettes for single occupancy. The observation car has a light weight of 141,000 lb. and seating capacity of 68. The car is designed with a rear main lounge, cocktail lounge, lower bar and Astra-Dome.

Construction of the Cars

The Train of Tommorrow cars are built primarily of low-alloy high-tensile steel, using the Pullman-Standard welded-girder design with certain modifications in the underframe and roof framing to accommodate the Astra Dome on each car. The structures are designed to meet fully the requirements of the R.P.O specifications and the latest A.A.R recommended practice as adopted for new passenger-train cars.

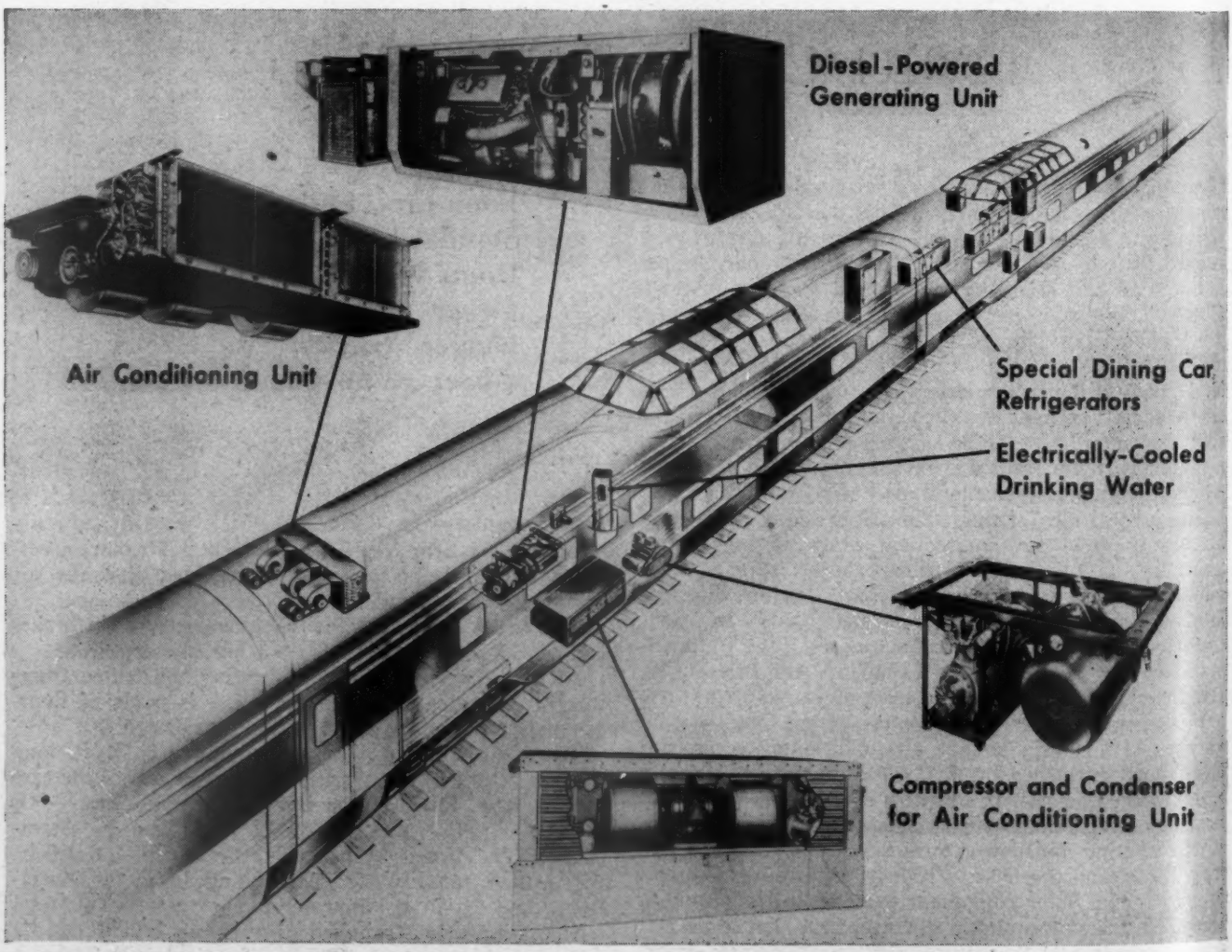
To provide for the lower-level floor under the dome, which is depressed into the underframe, it was necessary to cut off the longitudinal underframe members at each end of the dome section where they are attached to heavy built-up arc-welded box-section beams, placed crosswise of the car. These beams are connected at the side post lines to built-up welded box-section members, placed longitudinally, which transmit buffing loads through this section of the car. The box-section members line up horizontally with the center sills to avoid eccentric loading and their cross-sectional area exceeds that of the center sills. Zee and angle side sills extend the full length of the car and are riveted in the dome portion to the box-section members.

The floor in the lower level is supported on built-up arc-welded H-beams, paced crosswise of the car and extending up and connected to the side sills. Pressed Z-shape longitudinal stringers are placed between the beams. Bottom sheets of steel are arc-welded to the underframe members so as to tie together all underneath framing at this portion of the car.

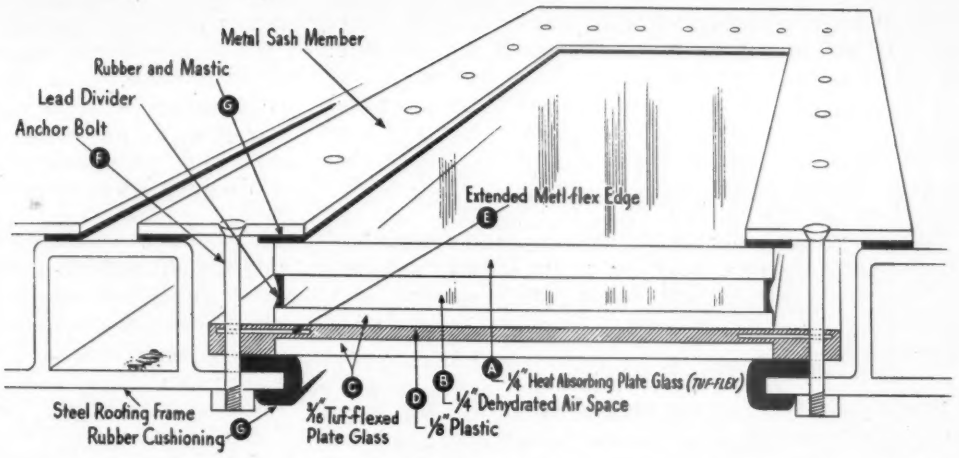
In the roof, the rolled Z-shape side plate is replaced with a built-up arc-welded box section extending the full length of the car. This reinforced side-plate section carries the compression stresses in the roof and makes up for the loss of material in the roof because of the cutout for the dome.

The dome roof members between the windows are box sections made up of flanged channels spot-welded together except at the car center line where the air duct is located. All roof members are fitted and arc-welded together and the whole unit is arc-welded to the main roof members. These members do not carry any stresses from static loading in the car, flexible connections to the main roof members having been provided at certain points to accomplish this result. The dome roof construction is equal in strength to that of the balance of the car roof.

The upper floor in the dome is supported by a structural member extending the full length of the dome and the full width of the car. This member is made up of double sheet steel with spacers between placed crosswise of the car; spacers and sheets are spot-welded and riveted together. The completed assembly is securely fastened to the side framing of the car so that in addition to supporting the floor, it acts as a tie between the two sides for


Diesel-Powered Generating Unit
Air Conditioning Unit
Special Dining Car Refrigerators
Electrically-Cooled Drinking Water
Compressor and Condenser for Air Conditioning Unit

Sectional view showing location of Frigidaire air-conditioning and refrigeration units



Cross-section of Thermopane glass windows in the Astra Domes—Similar construction is used in the side windows

the length of the dome where the regular roof framing has been cut away.

To prove the strength of the design, several physical tests were conducted using as a specimen the car structure for the sleeping car. These tests included a static load test, torsion jacking test and A.A.R. compression or squeeze test. The first two were conducted in the Pullman-Standard plant under the joint direction of engineering department representatives of the Electro-Motive Division and Pullman-Standard. The third test was conducted at the Altoona, Pa., test plant under the supervision of A.A.R. representatives.

Partial List of Materials and Equipment on the General Motors "Train of Tomorrow"

Steel sheets	American Rolling Mill Company, Chicago Inland Steel Company, Chicago Youngstown Sheet & Tube Co., Chicago
Sheets and extrusions	Aluminum Company of America, Pitsburgh, Pa.
Steel strip	Weirton Steel Company, Weirton, W. Va.
Stainless-steel strip	Allegheny Ludlum Steel Corporation, Pittsburgh, Pa.
Stainless mouldings	Brasco Manufacturing Company, Harvey, Ill. Pyramid Metals Company, Chicago
Miscellaneous castings	Allied Steel Castings Company, Chicago Calumet Steel Castings Company, Hammond, Ind. Chicago Malleable Castings Company, Chicago Universal Steel Castings Company, Chicago
Steel bars	Republic Steel Corporation, Chicago
Truck frames	General Steel Castings Company, Eddystone, Pa.
Center-plate, equalizer coil-spring, side-bearing, spring-plank, and journal-box pads	Fabreeka Products Company, Boston, Mass.
Axles	Standard Forgings Corporation, Chicago
Wheels, steel plates, shapes, bars, sheets, and stainless steel	Carnegie-Illinois Steel Corporation, Pittsburgh, Pa.
Roller bearings	Hyatt Bearings Division, General Motors Corporation, Harrison, N. J.
Draft gears	Waugh Equipment Company, New York
Couplers and yokes	National Malleable & Steel Castings Co., Cleveland, Ohio
Hot-bearing detectors (joint development)	Union Switch & Signal Co., Swissvale, Pa. Westinghouse Air Brake Company, Wilmerding, Pa.
Air-brake equipment	Westinghouse Air Brake Company, Wilmerding, Pa.
Clasp brakes	American Steel Foundries, Chicago
Brake shoes	American Brake Shoe Company, Chicago
Hand brakes	National Brake Company, New York
Insulation	Gustin-Bacon Manufacturing Company, Kansas City, Mo.
Plymetl	Haskelite Mauufacturing Corporation, Grand Rapids, Mich.
Thermopane sash	Cadillac Glass Company, Chicago
Thermopane safety glass	Libbey-Owens-Ford Glass Company, Toledo, Ohio
Cab signaling and train control	Union Switch & Signal Co., Swissvale, Pa.
Rador train heating and temperature control equipment	Vapor Car Heating Company, Chicago
Air-conditioning equipment	Frigidaire Division, General Motors Corporation, Dayton, Ohio
Air grilles	Air Products Company, Waterloo, Iowa
Anemostat	Anemostat Corporation of America, New York
Fans	Westinghouse Electric Corporation, Pittsburgh, Pa.
Electrical equipment	Graybar Electric Company, New York Pyle National Company, Chicago Westinghouse Electric Supply Company, New York
Car light and power equipment	Detroit Diesel Division, General Motors Corporation, Dayton, Ohio Delco Products Division, General Motors Corporation, ayton, Ohio
Batteries	Electric Storage Battery Company, Philadelphia, Pa.
Wire and cable	Hazard Insulated Wire Works Division, Okonite Company, Wilkes-Barre, Pa.
Light fixtures	Luminator, Inc., Chicago
Flooring	Tuco Products Corporation, New York
Roller doors	Kinnear Manufacturing Company, Columbus, Ohio
Door operators	National Pneumatic Company, Rahway, N. J.
Locks	Yale & Towne Manufacturing Company, Stamford, Conn.
Hardware	Adams & Westlake, Elkhart, Ind.
Rubber mattresses, sofa and chair seats; plastic floor and wall covering; wall panels	United States Rubber Company, New York
DuLux paints; Lucite decorative panels	E. I. du Pont de Nemours & Co., Wilmington, Del.
Wallpaper	Varlar, Inc., Chicago
Vestibule curtains	Pantasote Company, New York
Furniture	Beck & Blatchford Co., Chicago
Dining chairs	General Fireproofing Company, Youngstown, Ohio
Seats	Heywood-Wakefield Company, Gardner, Mass.
Seat covering, drapery, upholstery fabric, carpet	Goodall Fabrics, Inc., New York
Windsorweave upholstery fabric	Broad Brook Company, Broad Brook, Conn.
Nylon seat covering	Vanity Fair Mills, Inc., Reading, Pa.
Leather	Ashtabula Hide & Leather Co., Ashtabula, Ohio
Upholstering leather	Blanchard Bros. & Lane, Newark, N. J. Eagle-Ottawa Leather Company, Grand Haven, Mich.
Bar equipment	Angelo Colonna, Philadelphia, Pa.
Window capping and table tops	Formica Insulation Company, Cincinnati, Ohio
Flat and hollow ware	International Silver Company, Meriden, Conn.
Glassware	Libbey Glass Division of Owens-Illinois Glass Company, Toledo, Ohio
Chinaware	Onondaga Pottery Company, Syracuse, N. Y.
Refrigeration	Frigidaire Division, General Motors Corporation, Dayton, Ohio
Electric cooking equipment; garbage disposal	Hotpoint, Inc., Chicago
Dishwasher	Hobart Manufacturing Company, Troy N. Y.
Odorsorbers	W. B. Connor Engineering Corporation, New York
Radio	Delco Radio Division, General Motors Corporation, Kokomo, Ind.
Radiotelephone	Motorola, Inc., Chicago
Magnetone magnetic wire reproducer	Brush Development Company, Cleveland, Ohio
Train interphone	Automatic Electric Sales Company, Ashtabula, Ohio
Bell System mobile telephone	Illinois Bell Telephone Company, Chicago
Drinking cups and cabinets	United States Envelope Company, Paper Cup Division, Worcester, Mass.
Blankets	Chatham Manufacturing Company, Elkin, N.C.
Nylon yarn, blanket binding	E. I. du Pont de Nemours & Co., Wilmington, Del.
Dumb waiter	D. A. Matot, Inc., Chicago
Paper products	Beecher, Peck & Lewis, Detroit, Mich.
Uniforms	H. D. Lee Company, Kansas City, Mo.
Water tanks	Scaife Company, Oakmont, Pa.
Storage tanks	Chicago Steel Tank Co., Chicago
Pipe covering	Johns-Manville, New York
Sweat fittings	Chase Brass & Copper Co., Waterbury, Conn.
Hoppers	Duner Company, Chicago
Hoppers, washstands, fittings	Crane Company, Chicago

In the first test, a 100 per cent overload in the car failed to show excessive stress on any of the 250 strain gages applied at critical points throughout the structure. Most gages showed stresses lower than expected.

In the second test, performed to check the stresses and deflection when jacking a fully-loaded car at the four corners with the added condition of having one jack fail, no gage showed excessive stress and there was little deflection at the unsupported corner of the car.

In the third test, the car showed an average deflection between body bolsters of 0.485 in. when a maximum load of 839,396 lb. was applied on the center-sill ends, this deflection being well within the limits set up in the A.A.R specifications.

Truck Design

The truck frames were furnished by the General Steel Castings Corporation. The truck construction incorporates Electro-Motive type outside swing hangers, Hyatt roller-bearing journal boxes which cushion the lateral movement of the axles, coil spring suspension, hydraulic shock absorbers and composition cushioning pads to dampen vibration and noise.

In the standard suspension of railroad cars, swing hangers are mounted inside the truck frame, 56 in. apart at the lower end as compared with 96 in. in the Train of Tomorrow trucks. This difference tends to reduce car body roll, and angular placement of the spring hangers causes automatic banking on curves in proportion to the speed of the train and the degree of curvature. Total car sidesway is limited by this construction and in a test was found to be less than 6 in. total at the roof level, as compared with 28 in. with conventional trucks.

Controlled lateral movement of axles in the Hyatt journal boxes is cushioned on a synthetic rubber member interposed between the axle thrust block which engages the end of the axle intermittently and the front or outside cover of the journal boxes. In passing over track irregularities or curves, for example, axle side thrust is effectively cushioned by this construction.

Coil spring suspension, in conjunction with Delco direct-acting hydraulic shock absorbers, assures a resilient truck with harmonic oscillations at critical speeds suitably dampened. An additional transverse and horizontal shock absorber installation is made on the rear truck of the observation lounge-car to prevent excessive whip action when rounding curves at high speeds.

To dampen high-frequency vibration still further and minimize noise, ½-in. Fabreeka pads are applied under the equalizer coil springs, side bearings and journal boxes, ⅝-in. pads under the truck center plate castings and 1¾-in. pads under the spring planks.

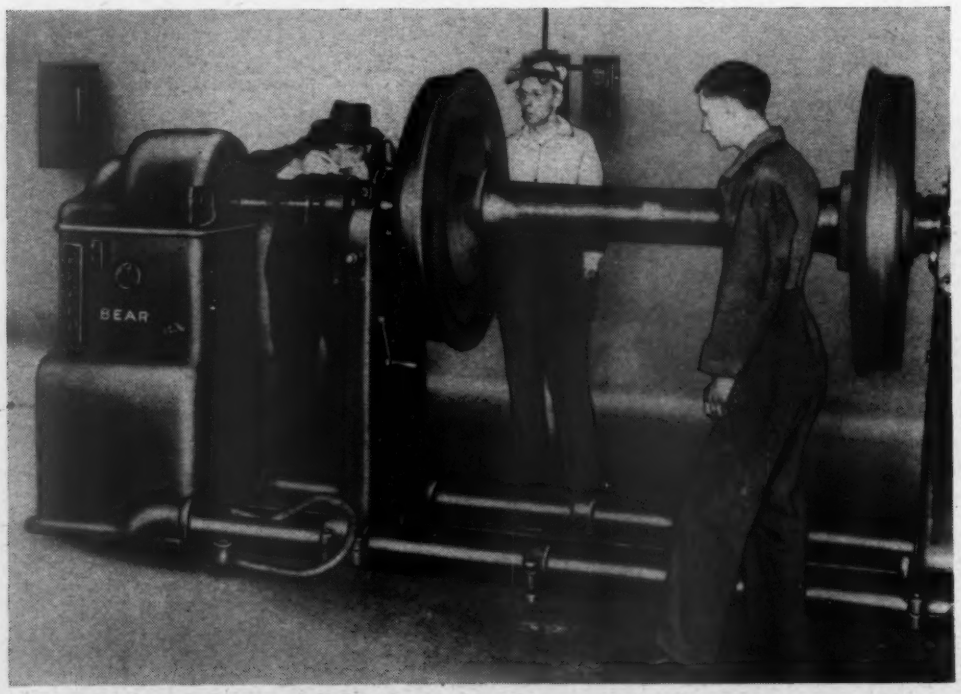
Waugmat Twin Cushions are applied to all cars.

The Chair Car

The Train of Tomorrow coach, or general-purpose day chair car, lends itself to a variety of uses, depending upon the length or type of passenger run on which such a car might be scheduled. It will seat 72 passengers, 24 in the Astra Dome in the roof, which provides unrivaled opportunity to observe the scenery in all four directions.

The lower section of the coach, on the depressed floor level directly beneath the Astra Dome, is divided into three partly segregated compartments, offering accommodations for 20 passengers, two seating seven persons and one six. They are reached from openings into the lower portion of the passageway, from which walls have been cut away at about shoulder height.

The forward and rear sections of the coach, at standard floor level, have 16 and 12 seats respectively. Chairs are of the reversible type with adjustable footrests. Each seat reclines to nine positions.



The car wheels were dynamically balanced on a Bear No. 400 machine at 325 r. p. m.—Amounts of metal varying from 1 to 15½ ounces were removed by hand grinding from indicated points on the inside of the rims

There are two good-sized dressing rooms at the rear of the car and two smaller lavatories at the front.

The coach has two large luggage compartments, one on each side of the exit at the rear of the car, in which to store baggage for quick unloading without piling it in vestibules and aisles.

As an example of one of the color schemes used in the train, the ceiling and main coach sections and the side walls are light yellow, walls of the passages at the ends are white and in the center gray. The lower portion of this surface, to window height, is a special Es Es wear-resisting material, to withstand rubbing from baggage and other hand material. Draperies are Chinese lattice of gray and yellow and the seat upholstery is a diamond pattern in gray and green.

Lighting is direct in the center, supplemented from the side and above by beamed light directed straight to each

chair for reading purposes. There is a built-in ash tray in the arm of each seat. A partition in the stairway to the Astra Dome houses a locker for section tables, recessed water cooler, cup dispenser and empty cup receptacle. There also is located the inter-train telephone, porter's seat, annunciator and chimes, and a coat locker.

Sleeping Car

The sleeping car contains three compartment rooms, each with two lower berths, two drawing rooms, each with two upper and one lower berth, and eight rooms of new duplex roomette design, each for single occupancy. All berths in the car run lengthwise of the train.

Each of the compartments and each of the drawing rooms is decorated in a distinctive combination of colors, carpeting and draperies that is different from all others.

The compartments are on the lower level of the car and one of the berths in each converts to a sofa by day.

The two drawing rooms are located forward of the car, at the normal floor level, and may be connected if desired. In addition to the berths, each drawing room contains two upholstered lounge chairs, even when all three berths are made up. The lower berth converts into a sofa in daytime. There is a lavatory and toilet room opposite the entrance to each drawing room and a large overhead baggage space extends the width of the room. There is a wardrobe beside each entrance door.

A different interior decorating scheme is carried out in each drawing room. In one of them, for instance, the carpeting is Araby silver gray. The ceiling and an 18-in. width at the top of the walls is a medium tone of blue-green and the remainder of the walls are a light, warm gray. Drapes are Cape Cod rose, with floral reds and greens on white. The sofa and one lounge chair is covered in super needle point green, the other lounge chair of needle point in egg plant color. The wood portions of the chairs are light, bleached walnut.

The Duplex roomettes are built so that the level of one is two steps above the aisle and the adjoining one is level with the aisle. In the roomettes at aisle level the berth pulls out at floor level, pushing away, drawer-like, under the floor of the adjoining room when not in use. The berths in the other roomettes pull down from the wall at one end, fully made up. Opposite the sofa there is a high level recess for baggage, a wash stand and toilet.

Dining Car

The dining car, like other units, departs completely from usual design. It furnishes table service on three levels, one of them in the Astra Dome roof compartment. The second is at the conventional level, taking all the space at one end of the car, and the third section, somewhat smaller, occupies part of the depressed central portion under the Astra Dome. A service pantry, connecting to the main kitchen, is also in the lowered portion of the car.

Waiters serving patrons in the dome section receive food and dispatch dishes by means of a dumb waiter connecting to one end of the kitchen directly below.

In the Astra Dome portion of the diner the aisle is off center, providing tables for couples on one side and for groups of four on the other. There is a built-in lamp at each table as well as ceiling lighting. Wide vision windows are installed.

The forward space in the Dome is given over to service, the furnishings including a china locker, refrigerator, coffee maker, toaster, silverware racks, bottle receptacles, an ice well, sink with covers and some storage space.

In the space under the Astra Dome is a reserved "private" dining room, reached by an illuminated glass step down from the passageway. It seats 10, in groups of five.

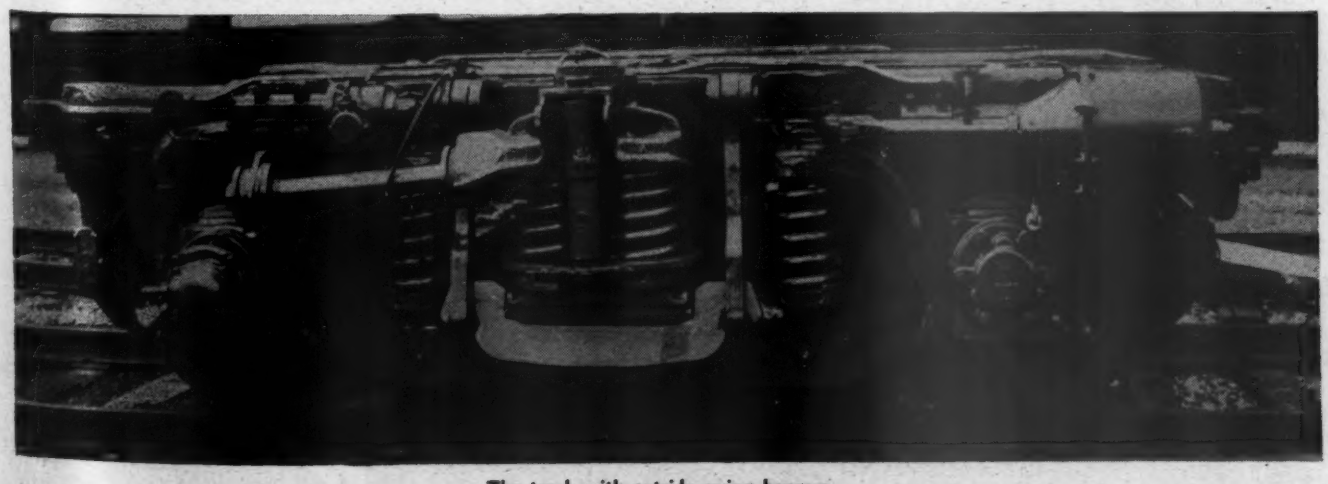
The main dining section seats 24 persons. Tables for two are along one side, triangular in shape, with built-in chairs. On the other side of the car, tables for four are set cornerwise of the car, with two built-in seats on the car-wall side and two movable chairs on the sides of the tables nearest the aisle. The arrangement permits access to all seats without disturbing others as well as providing wider passing room in the center aisle. There is direct overhead lighting from circular ceiling fixtures, but these may be dispensed with at times as there also is indirect lighting concealed in satin finished stainless steel troughs above the window line.

The steward's compartment, to the right of the stairs, contains a refrigerator, the intertrain phone, space for cigars and cigarettes and the steward's locker. Beverage storage lockers also are located beneath and beside the stairway to the Astra Dome.

Kitchen and Refrigeration

Cooking and refrigeration facilities in the kitchen and service pantry are arranged for utmost utilization of space, with the latest of equipment.

In each car, electrical requirements are supplied by a Frigidaire-Detroit Diesel power unit, mounted under each car, making each car independent of the locomotive or adjoining cars for current to operate lighting fixtures or other electrical apparatus. The extra needs of the dining car are cared for by a 40 kw. auxiliary power



The truck with outside swing hangers

unit, driven by a four-cylinder Detroit Diesel engine, with an installation engineered by Frigidaire. Delco Products Division cooperated in supplying parts of the power installation throughout the entire train. The dining car kitchen is all-electric, with three ranges, fry kettles, broilers, plate and cup warmers, hot food table, coffee urn, juice extractor, dishwasher and garbage disposal unit operated by the Diesel-generated power originating within the car itself.

The dining car also has unusual facilities for storing large quantities of fresh and frozen foods, beverages, etc. Eleven separate refrigerated fixtures provide a total of 111 cu. ft. of storage space, or more than would be supplied by 15 standard size household refrigerators.

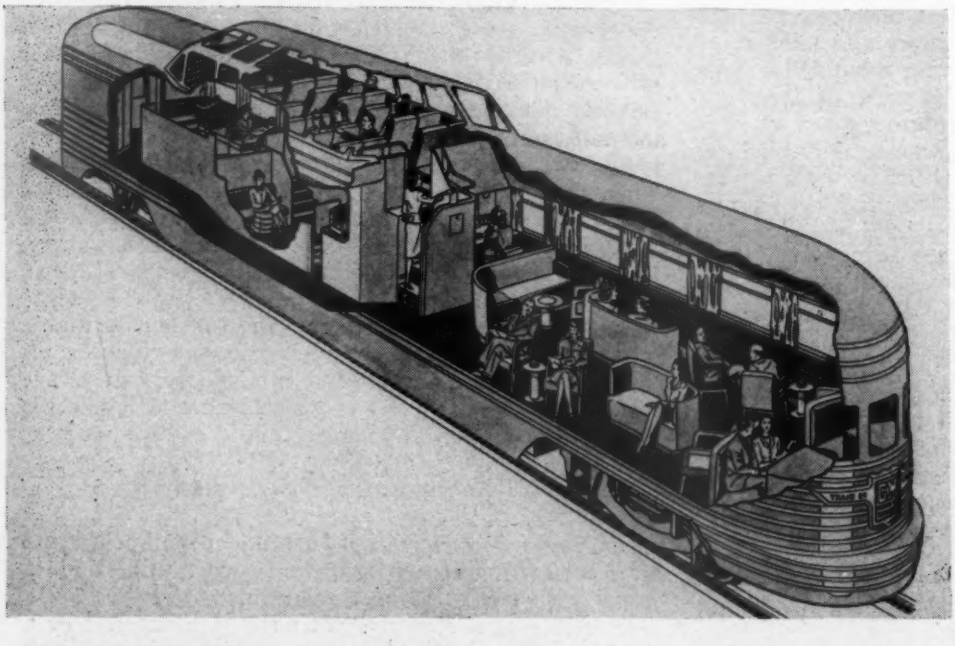
Four compact Frigidaire condensing units, concealed at different locations in the car, furnish dependable refrigeration to the various fixtures.

Lounge Car

There are four levels in the lounge car, with 68 seats, more than half of them movable to permit group formation as in clubs, homes and on shipboard. The dome seating 10 persons. The small bar, at the rear, serves all lounges. It has a Weldtex striated plywood paneling, stained just off natural, with a dark top and a metal and picture glass back bar and front trim. Chairs in the lower lounge are covered with a honey-colored leather. Tables have a Formica top, hard, non-stainable, non-burnable, with a special inlaid design, different on each. The wall covering, Varlar material, also resists stains from ink, lipstick and the like.

The front lounge, at the same level as the rear observation lounge, may be reached either by several steps up from the lower lounge or along the passage way to the front entrance. Seats are built in, upholstered in chartreuse nylon with bolster rolls of rose nylon. Light drapes carry on the tropical motif. Inner walls are silver gray. The carpeting is the same as in the lower lounge. Stainless steel trim follows the sides and tops of the openings to the passageway. Lighting is from circular ceiling fixtures.

The Astra Dome in this car, as in the others, has conventional coach seating for 24. The carpeting on stairs and the aisle is Araby peach, as in the rear observation lounge. The dashboard at the front of the dome is covered with turquoise leather, as are the arms and bolster rolls of the chairs. The seats are upholstered in a turquoise fabric. Walls and upper structure of the dome are painted in a gray tan.



Four-level arrangement in the observation-lounge car

feature, carrying 24 seats at the scenic above-roof level, can be varied if desired for transcontinental trains, with seats of chaise lounge type. The rear cockpit allows a field of vision exceeded only in the Astra Dome.

Viewed from amidship in the car, the rear observation lounge has an oval appearance, with rich dark color in the carpeting and wainscoting, lighter tones above, and harmonizing furniture in turquoise and gray. Most of the chairs in this section are movable.

The carpet is Araby peach. The walls are covered to window height with red Velvean leather, with a satin stainless steel moulding and trim. Drapes with a varicolored Persian tree design on a light background conceal all of the wall columns between the extra-wide windows, giving the effect of complete glass encirclement. The upper walls are gray and the ceiling a light ivory. Lighting is both direct and indirect. Lounge chairs and settees are upholstered in nylon in turquoise and in gray super needlepoint.

At the end of this rear lounge, recessed beside the stairway to the Astra Dome, is a desk with radio telephone, clock, radio control and wire recording apparatus.

The lower section of the observation car, beneath the Astra Dome, contains an intimate cocktail room bar,

Special decorative treatment designed to take away the drabness of many train lavatories has been given. The women's lavatory has two walls of V-board covered with an Adam and Eve pattern in yellow, gray and green and two walls painted light yellow and gray green. The floor, coral in color, is covered with Es-Es material, selected for durability, appearance and easy cleansing qualities. The men's lavatory has a floor of gray blue Es-Es material, two walls of V-board with a simulated matted finish, and two walls light yellow and rust.

Mechanical Accessories

In addition to the unique structural arrangement of the cars and the carefully worked out pattern for colorful interior decoration, numerous mechanical accessories and new materials add much to the comfort of passengers.

All windows, including those in the Astra Domes, are glazed with special railroad Thermopane, consisting of

(*Continued on page 407*)

Chicago & North Western Instruction Car

To facilitate and make more practical its training program, the Chicago & North Western has put in operation a car completely equipped for the training and instruction of enginemen, trainmen, mechanics, and other employees on a wide variety of specialized subjects. The car, built at the Chicago shops from a 70-ft. all-steel lounge car, contains a motion-picture projection booth; a lecture room with seats and tables to accommodate 35 persons; complete air-brake equipment, including dials, gauges, and levers, and complete living quarters for the instructor who travels with the car. The car also contains a recorder stand with three Esterline Angus instruments for recording time, distance, brake-cylinder and brake-pipe pressure, which permits the duplication of the services of a dynamometer car in everything but drawbar pull.

The Esterline Angus recorders can be operated individually, collectively, intermittently, or continuously. Time-interval pens on the instruments operate by a combination of mechanism and electric eye. Distance pens can be operated either manually or automatically. A 32-volt, 450-amp. hr. storage battery, which is independent of the storage battery used for car lighting, supplies the electricity for the operations of the instruments.

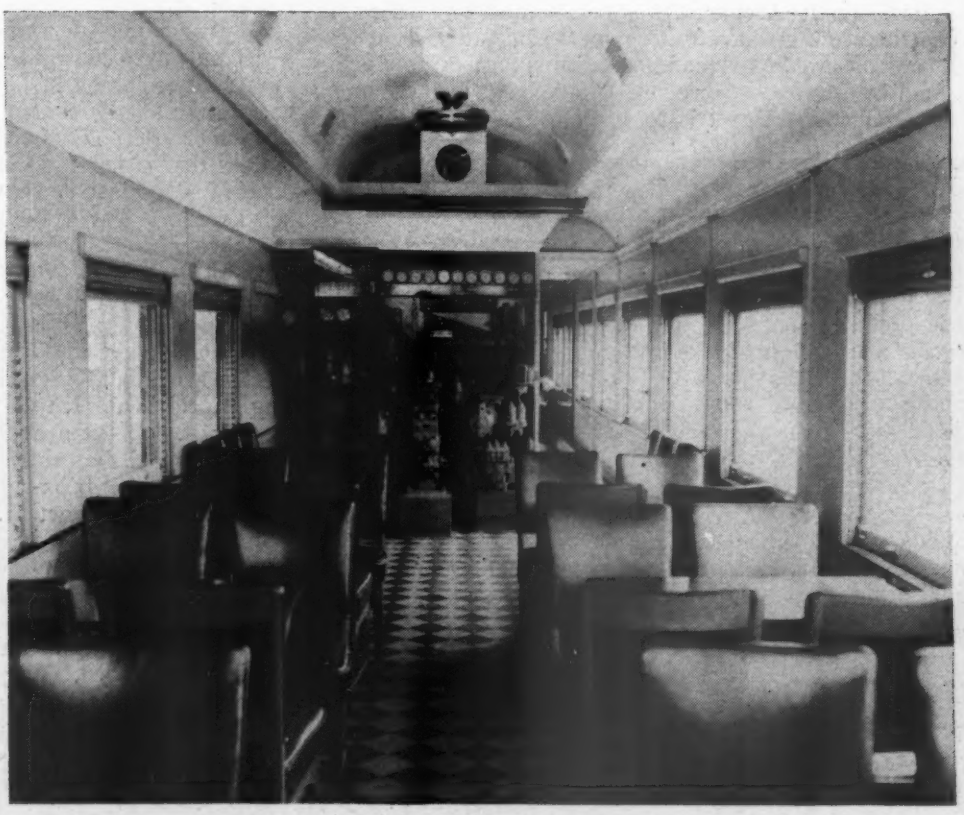
Gauges on the air-brake panel show pressures and operation of the various types of brakes installed on North Western steam and Diesel locomotives, both freight and passenger, including all operations and applications of the brakes. The 24-RL locomotive brake equipment on the panel is complete with brake speed-governor control, automatic train control, and safety control as used on the Chicago-Omaha Diesel locomotives. There is also the instrument panel of a Diesel locomotive with the gauges showing the amperes delivered by the generators as well as regular brake application.

An a. c. motor-driven air compressor mounted under the car supplies air pressure for the operation of the equipment.

In the projection room are projectors for showing 16-mm. sound and silent films, a stereoptican projector for slides, a dual speed turn-table, and an astatic pickup and hand microphone. The public address system installed here can be used from this room or from the front of the classroom. A spring-roller screen for the projection of slides and movies is suspended above the air-brake panel in the classroom. A demountable blackboard is also available for chalk talks.

The Type K and Type AB freight brakes with which the car is equipped are used not only for demonstration purposes, but are also used when the car is hauled in freight trains.

A vapor hot-water heating boiler provides heat when no outside steam source is available, or when the car is moving in a freight train.



The classroom of the instruction car set up with removable tables

N. & W. Automatic Switcher

Converted experimental locomotive design with fuel and water controls for either operating or standby service

ABOUT two years ago the Norfolk & Western initiated the development of a coal-burning switching locomotive which would have many of the advantages claimed for other types of switchers, such as high availability, flexibility, reliability and low, overall operating costs.

At the outset it was determined that the locomotive should be mechanically fired to give a wide range of operating flexibility with respect to fuel available and engine capacity. A stoker, modified from a standard locomotive unit, was selected because of its reliability and record in other services. Because of the inherent simplicity of steam jet coal distribution in locomotive practice, this feature was to be retained in the modified stoker.

Early in the preliminary study, automatic combustion controls were given consideration because it was felt that it was desirable to minimize manual attention during stand-by service. Since one of the principal functions of combustion control is to regulate the flow of fuel in proper proportion to the air supply, a study was made of a mechanically drafted system.

The stoker engine and diaphragm-operated control valve are at the top of this assembly—the feedwater pump and the injector are below

A large number of experiments with mechanical draft have been conducted on locomotives both in this country and in Europe. This type of locomotive drafting had not progressed for three reasons: First, fan operation was difficult to control by hand because of widely fluctuating loads common in locomotive practice, while no successful automatic control system had been devised to do this job. Second, in previous experiments it had been found that either the fans were of too little capacity or that fans of adequate capacity became too large for proper installation. Third, the abrasive nature of cinders passing through locomotive front ends caused rapid deterioration of fan blades. In recent years, however, successful combustion controls have been developed to a high degree of refinement and it was considered that control of the fan would not be a problem.

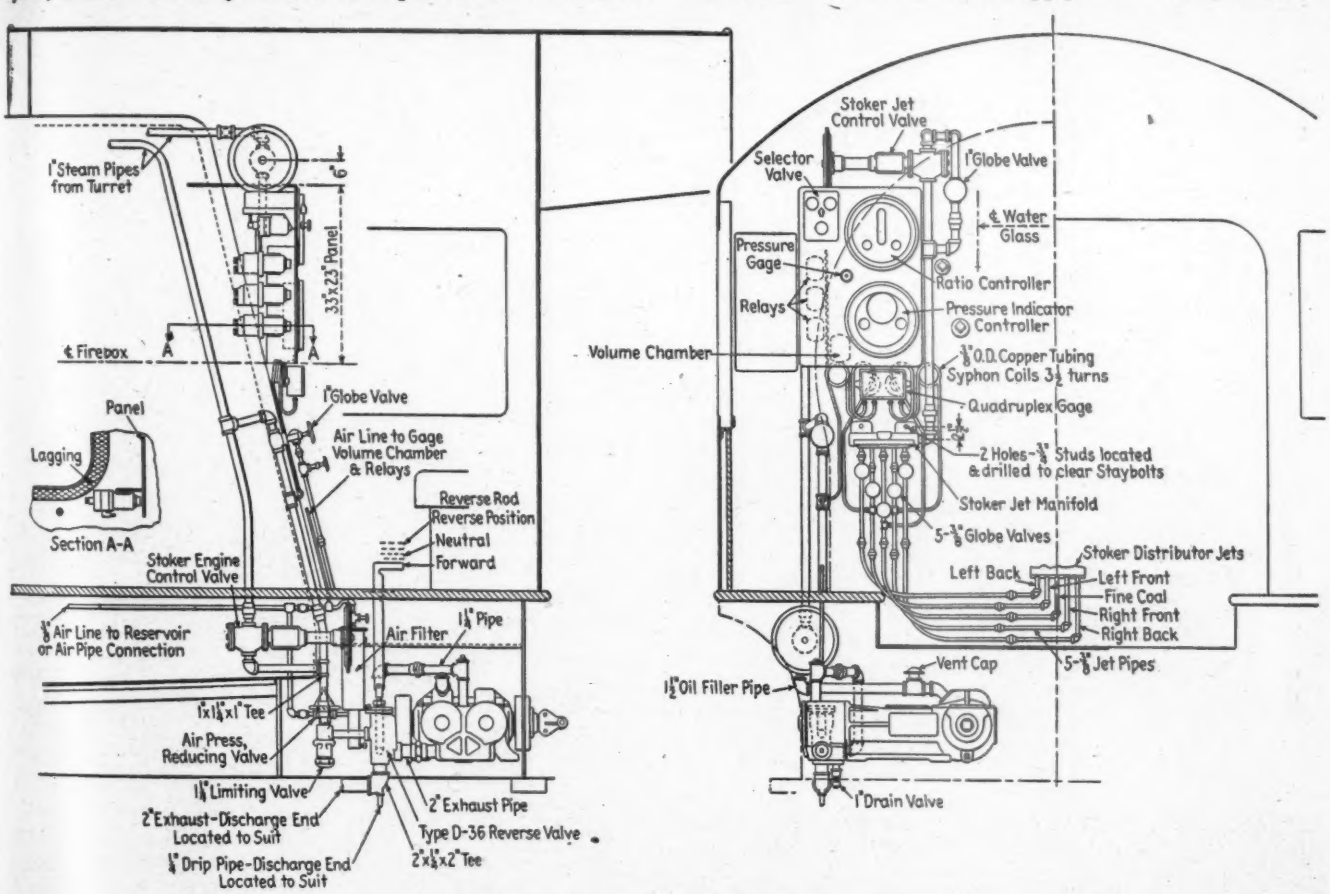
The art of fan design had progressed, particularly during World War II, to a point where high-speed fans of proper design were available for handling the air requirements of the proposed locomotive. New materials with excellent erosion-resistant qualities were also available for fan construction. It was decided that with the recent experience on induced-draft fans, the drafting of the locomotive mechanically would present no particular problem. The use of a fan was considered seriously from the beginning since a successful means of controlling draft with a conventional locomotive nozzle has not as yet been developed. Therefore, it was essential, in selecting automatic combustion controls, that a mechanical draft system be used in order to meet operating conditions.

Preliminary proposals of a locomotive with a high ratio of radiant heating surface to convection surface were

made by the engineering department of the Standard Stoker Company, New York, and these proposals were studied jointly by the motive-power department of the N. & W. and engineers of the Standard Stoker Company.

In the final analysis it was decided that, because of shop schedules, the first step in the experimental work would be taken by converting an existing locomotive rather than by building a new one for application of the combustion equipment. This decision made possible the study of the general arrangement and experience in converting existing switchers, of which there are a large number in service. Following this decision to convert an existing locomotive, an M2 class N. & W. locomotive, 12-wheel, 4-8-0 type, with grate area of 45 sq. ft. and 24 in. by 30 in. cylinders, was selected for the development. Following the decision by the railroad to proceed with the project, a detailed study of service requirements was made. design is such that the turbine and fan are installed in a separate housing as a unit and is easily accessible from the front end. Live steam is used to drive the fan since it was found that to use exhaust steam from the cylinders of the engine would complicate governing the control of the fan and would be less attractive for overall economy reasons than to use live steam direct from the boiler. Exhaust from the engine cylinders, which would normally pass through the exhaust nozzle, was relocated so that a free exhaust, through a silencer, was provided. The boiler was rebuilt with smaller flues than it previously contained and a combustion chamber was installed to provide an additional area for radiant heating purposes.

The stoker was modified so that the gear ratio was extremely high to give smooth operation at very low rates. A special feed screw was designed accurately to meter the coal in relation to the air supply furnished by the fan.



General arrangement of piping for automatic fuel and water controls

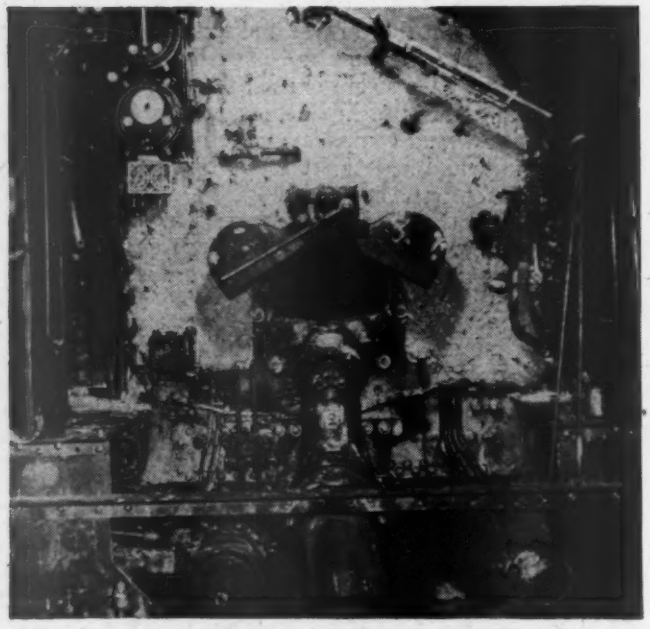
The Bailey Meter Co., Cleveland, Ohio, was called in for consultation on combustion control, and the L. J. Wing Manufacturing Co., New York 11, cooperated in the selection, design and manufacture of the mechanical draft system.

Proposed control apparatus included a controller actuated by boiler pressure drop. Controls were to operate the fan, stoker jets and stoker. An auxiliary control system for standby purposes was proposed for supplying feedwater to the locomotive. Because of its simple operating characteristics, an induced draft fan, driven by a steam turbine, was proposed. Due to the nature of switching service with respect to its influence on firing conditions, it was thought that an ashpan damper system should be included.

Final design features were as follows: An induced draft fan, turbine driven, was mounted in the front end of the locomotive. In order to install the fan it was necessary to make an extension to the locomotive front end. The Ashpan dampers were installed that are to close during idle periods when the fan is not in operation.

The Control System

The control equipment as installed consists of a main pressure controller actuated from boiler pressure. Air flow to the firebox is controlled through a special controller which is actuated from the main pressure controller. The main pressure controller also actuates the steam jets for coal distribution and the stoker itself. Control of the speed of the stoker engine is obtained through a special hydraulic tachometer connected to the engine through a V belt. While these controls operate in parallel, they are adjusted so that as the boiler pressure drops from a predetermined figure, the fan starts first, then the steam jets for the stoker go into operation and finally the stoker is put in service. With this arrangement the air flow to the firebox always precedes stoker operation, and in this way, smoke is kept at a



Backhead, without jacket, showing the Standard stoker installation and, at the upper left, the Bailey Meter control panel—The feedwater pump regulator may be seen at the left of the firebox

minimum. While the functioning of the controls depends on resistance due to air flow through the grates, firebox, tubes and front end, the controls are sufficiently flexible to take care of variations in fuel bed thicknesses.

During the initial stages of the development work it was considered desirable to use a cinder collecting system on this locomotive and at the same time work is proceeding with the design of a cinder trapping device which will entirely eliminate cinder discharge.

The experience gained so far with this locomotive indicates that the arrangement is entirely practicable and that coal-burning switching locomotives can be redesigned to incorporate an automatically controlled firing system using mechanical draft and a mechanical stoker, with the result that locomotives now considered costly to operate could show an improved overall economy.

Some of the advantages to be gained with this type of locomotive are: much longer periods between servicing; increased engine output due to lack of back pressure on the cylinders; less attention required from enginemen, thereby increasing the work that the engine may do in a given period; better combustion due to the regulating of fuel and air supply, therefore, contributing to a reduction in smoke.

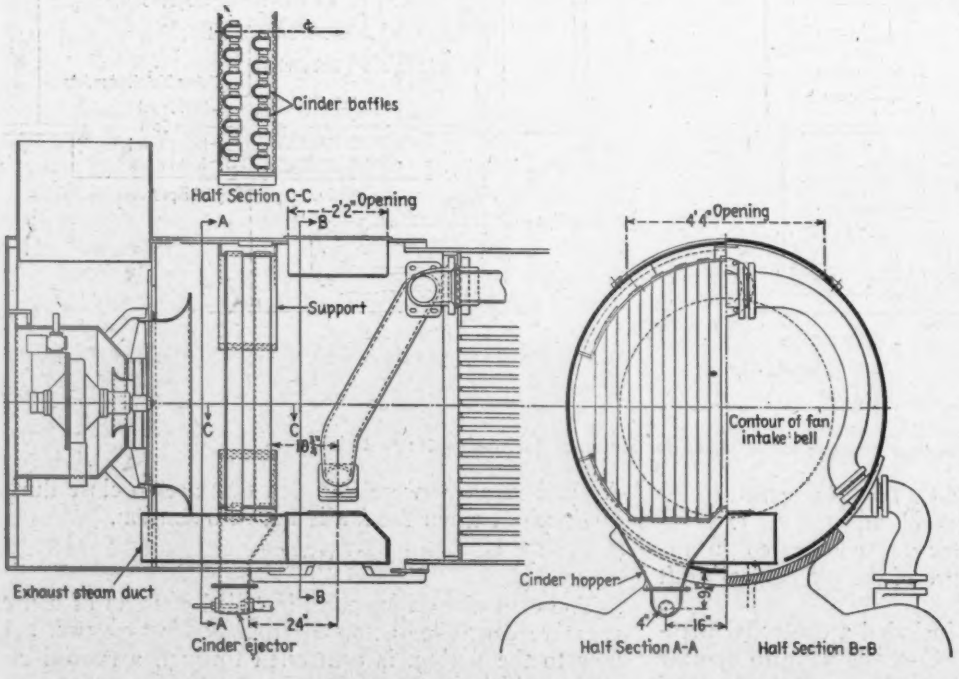
Improvements Made To Locomotive

In the conversion of the experimental locomotive a Standard HT stoker was installed along with Hennessy driving box lubricators, extended mechanical lubrication, Type E Franklin radial buffer between engine and tender, overfire air jets and cinder ejectors to return the cinders collected in the front end to the firebox. The capacity of the tender was increased to 11,000 gallons of water and 20 tons of coal.

In applying the combustion chamber to the firebox, the heating surface of the boiler was changed from 4,315 to 3,215 sq. ft. due to shortening the flues and removing the superheater. No change was made in the firebox proper, the original brick arch being maintained. Dampers, steam operated and automatically controlled, are used between the mud ring and the ash pan on each side of the firebox.

The application of the fan for induced draft required an extension on the end of the smoke box. The fan, furnished by the L. J. Wing Manufacturing Company, has a capacity of 37,500 cu. ft. per min. when operating at a speed of 2,600 r.p.m. The rotor of the fan has seven blades made of No. 14-gage stainless steel, and is 42 in. in diameter. The blades of the rotor of the fan, in addition to being made of stainless steel, were chrome plated with a plating approximately .022 in. thick to resist abrasion of cinders and fly ash. Vertical U-shaped louvers interposed between the front flue sheet and the fan remove a portion of the cinders and fly ash which are collected in the smoke box and are returned by means of steam ejectors to the firebox. The exhaust from the cylinders is discharged into the front of the smoke box on the delivery side of the fan where it is mixed with the gases of combustion and passes out the stack.

The automatic controls for the boiler were furnished by the Bailey Meter Company. An air pressure of 28 lb. per sq. in. is maintained in the control system, the air being supplied from the main reservoir on the locomotive.



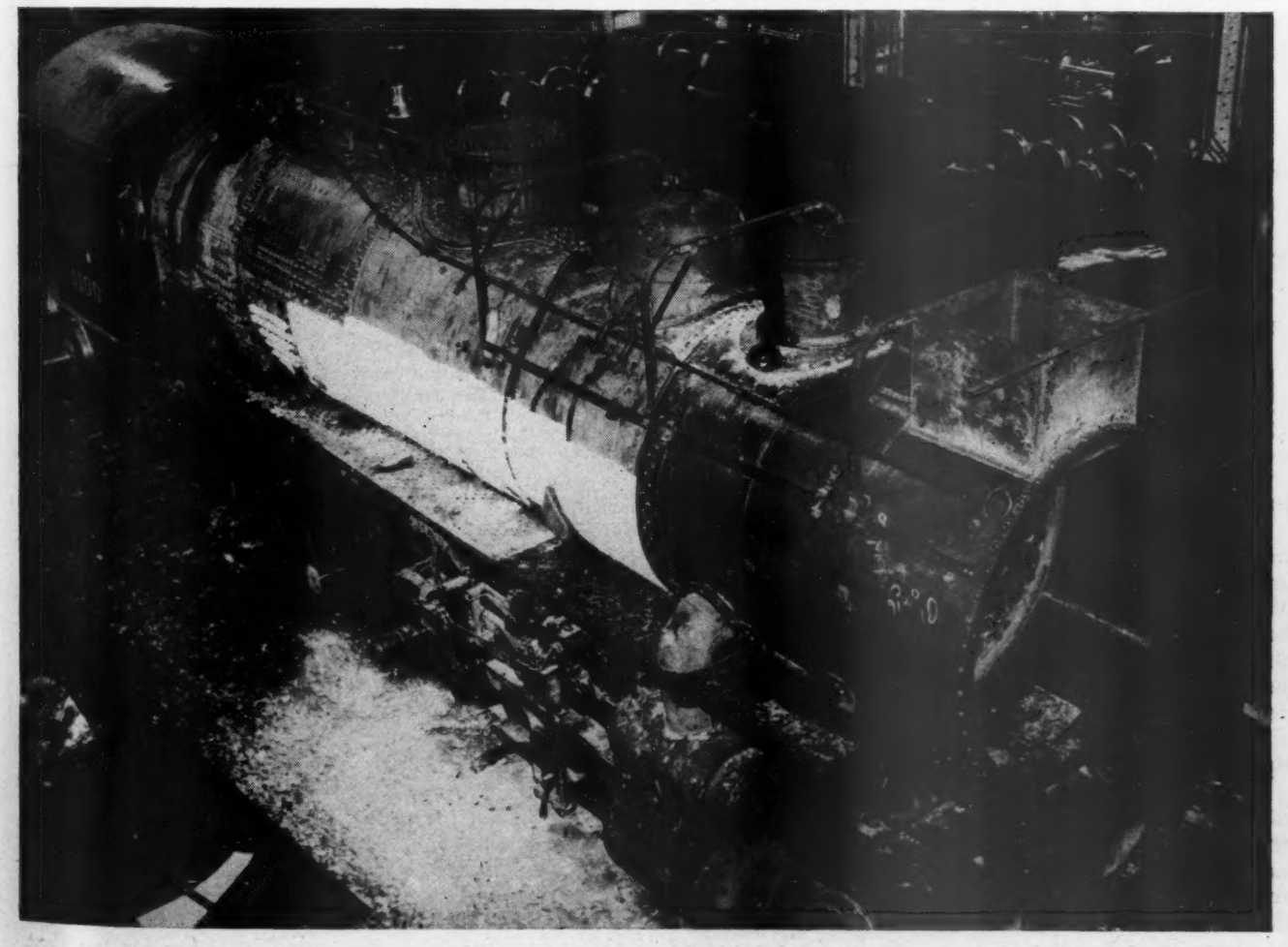
Arrangement of front end showing location of induced draft fan and exhaust stack

General Dimensions, Weights and Proportions of Norfolk & Western Experimental Switching Locomotive No. 1,100

Builder	Company shops
Locomotive type	4–8–0
Road class	M-2
Road number	1100
Date converted	1947
Rated tractive force (85 per cent), lb.	52,457
Weight in working order, lb.:	
On drivers	239,530
On front truck	40,000
Total engine	279,530
Tender loaded)	212,000
Tender (light)	80,000
Wheel bases, ft.-in.:	
Front truck	6–9
Drivers	16–0
Total engine	27–1
Tender	27–10½
Total engine and tender	70–0
Total engine and tender length, over couplers, ft.-in.	81–2¼
Driving wheels, diameter, outside tires, in.	56
Cylinders, number, diameter and stroke, in.	2–24 x 30
Valve gear, type	Walschaerts
Valves, piston type, size, in.	15
Factor of adhesion	4.56
Boiler data:	
Steam pressure, lb.	200
Firebox length, ft.-in.	8–4⅛
Firebox width, ft.-in.	5–4¼
Combustion chamber, length, in	48
Smoke box diameter, outside, in.	84
Diameter, first ring, outside, in.	80
Diameter largest ring, outside, in.	91
Arch tubes, number and diameter, in	2–3
Flues, number and diameter, in.	347–2¼
Length over tube sheets, ft.-in.	14–6
Fuel	Bituminous
Grate area, sq. ft.	45
Heating surfaces, sq. ft.:	
Flues	2,964
Firebox and combustion chamber	251
Arch tubes (included in firebox heating surface)	10.7
Total	3,215
Superheating	none
Total evaporative	3,215
Tender:	
Type	Rect. water bottom
Water capacity, gal.	11,000
Fuel capacity, tons	20
Trucks	Four-wheel

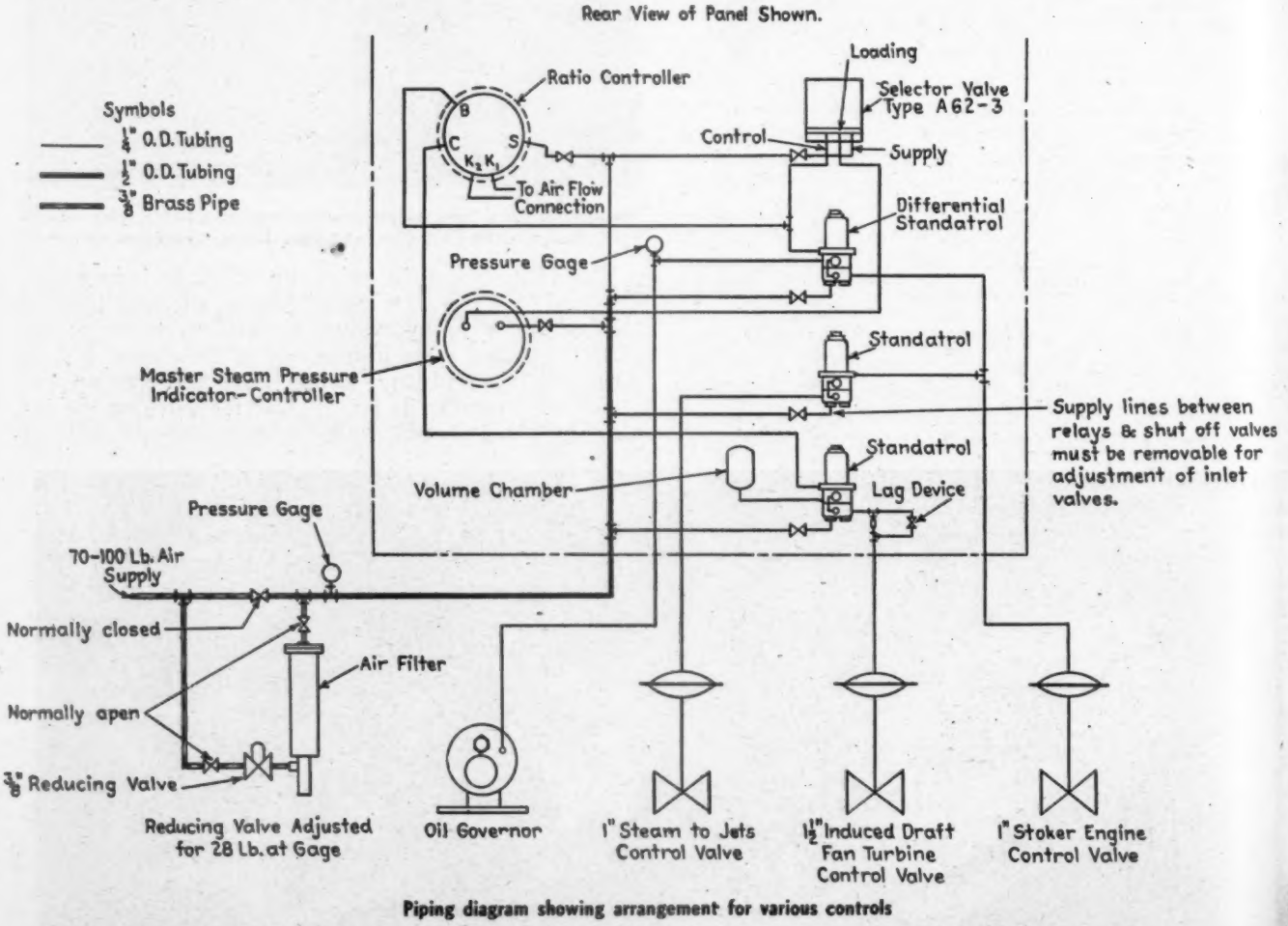
The control panel—Upper left: Hand-automatic selector valve—Upper right: Fuel-air ratio control—Lower right: Master steam pressure control

The controls consist primarily of three instruments mounted on a panel on the left side of the back head of the boiler. A steam-pressure controller actuates in the proper sequence other instruments in the control system when the boiler pressure drops below the pressure for which the controller is set. A selector valve on the instrument panel permits changing from automatic to hand



Locomotive No. 1100 during conversion at the Roanoke, Va., shop—The new smokebox, fan chamber, and induced draft outlet are plainly shown

control. A third instrument on the panel is a ratio controller whereby the desired ratio of air supplied to the coal fired may be controlled and varied as desired. The steam-pressure controller supplies air in proportion to the demand upon the boiler to devices known as "Standatrols" which, in turn, furnish air at a somewhat higher pressure to operate diaphragm steam valves for the fan, stoker blast and stoker. By these controls the amount of air induced by the fan as draft through the firebox and the amount of coal delivered by the stoker are proportional to the demand being made upon the boiler for steam. Incorporated in the ratio controller and actuated by a differential in the draft over the fire bed and in the smoke box is a governor which maintains the correct operating speed of the fan. An oil tachometer driven off the stoker engine automatically controls its speed.



Piping diagram showing arrangement for various controls

For the purpose of maintaining the desired water level in the boiler when the locomotive is left unattended in stand-by service, a duplex steam pump, furnished by the Worthington Pump & Machinery Corp., Harrison, N. J., has been installed on the left side of the locomotive under the cab. This pump, which has a capacity of 19 gallons per minute, is controlled by a thermohydraulic feedwater regulator mounted on the back head of the boiler.

The boiler is equipped with a low-water alarm and drop plugs in the crown sheet.

These improvements make it possible to keep the locomotive in service 24 hours a day with the exception of the time necessary to fill the lubricators, clean the fire and fill the tank with water, and the time required to re-coal the tender, approximately once every 48 hours, depending upon the service performed. The combustion has been improved with a reduction in the amount of smoke and a reduction in the cylinder back pressure resulting from eliminating the use of exhaust steam for drafting purposes. Maintaining the boiler pressure by automatic controls allows the fireman more time for observation and the safety of operation and permits leaving the locomotive unattended.

Explanation of Control System Diagram

Compressed air at 70-100 lb. per sq. in. is brought from the main reservior of the locomotive through a 28-lb. per sq. in. reducing valve and air filter to the control system. The 28-lb. per sq. in. supply pressure is piped to each of the three Standatrols, the master steam pressure indicator controller, the ratio controller and the selector valve. The master steam pressure indicator controller is equipped with two hands, a controlling hand, which can be set to maintain any desired pressure up to 200-lb. per sq. in. and an indicating hand which shows the actual steam pressure on the boiler. As the indicating hand begins to lag the controlling hand, a proportion of the 28-lb. per. sq. in. supply air is allowed to pass through the master indicator controller and enter the selector valve as a loading pressure. After passing through the selector valve the air leaves as a control pressure and is piped to the stoker standatrol and to the ratio controller at *B*. An oil governor driven directly from the stoker engine flywheel furnishes an oil pressure which opposes the control pressure. Depending upon the differential of these two pressures, a certain per cent of the 28-lb. per sq. in. supply pressure is allowed to pass through the Standatrol as an operating pressure directly to the diaphragm valve which controls the speed of the stoker engine. A connection is also provided in the line to the stoker engine diaphragm valve which furnishes the control pressure for the blast standatrol, which in turn, allows the 28-lb. per sq. in.

supply pressure to pass through and out as an operating pressure for the blast diaphragm valve.

The control pressure from the selector valve is piped into the ratio controller at *B*. Also leading into the ratio controller are two air flow connections *K-1* and *K-2*. One of these lines is connected into the smoke box and the other into the combustion chamber. As the fan gains speed the differential pressure, due to air flow, opposes the control pressure at *B*, which acts as a governor in allowing a proportion of the 28-lb. per sq. in. supply pressure *S*, to pass through the ratio controller as a control pressure *C* to the standatrol of the fan. This control pressure positions the fan standatrol which allows a proportion of the 28-lb. per sq. in. supply air to pass through and out an operating pressure to the diaphragm valve which controls steam supply to the induced draft fan turbine. A lag device in this line allows the fan to run for a short interval after the stoker engine and stoker blast have shut off.

General Motors "Train of Tomorrow"

(*Continued from page 400*)

two panes of glass separated by a dehydrated air space hermetically sealed in at the glass factory by a metal-to-glass bond. The outside sheet is heat-absorbing, glare-reducing polished plate glass and is heat treated or tempered for extra strength. The inner glass is composed of special laminated safety glass—really two panes of glass with an inner layer of plastic similar to automotive safety glass. The plastic has characteristics which further reduce glare. Tests indicate that these Thermopane units resist hurled objects better than steel of the same thickness as that used in the regular roofs of the cars.

The train also is equipped with a radio, public address and wire recorder system which has speakers located throughout the train, including the Astra Domes. The system may be used for radio broadcasts, public announcements, station arrivals, or recorded music.

The mobile telephone service on the Train of Tomorrow operates on the American Telephone and Telegraph Company's urban radio-telephone system, which provides telephone connections to all parts of the country while the train is in motion and within 25 miles of a connection with the system.

A station-stop plug-in system for connecting another telephone on the train to the city's regular telephone system, is another part of the built-in communication equipment. And, an intra-train telephone system between fixed locations on each car and in the locomotive will keep all members of the train crew in close touch.

Pneumatic door openers which operate on finger touch, are installed on all doors at the ends of cars.

Electric clocks are provided in the Astra Domes on the chair car, sleeping car and observation car.

Mechanical refrigeration to cool drinking water is built into the chair car and cool, fresh water is constantly circulated throughout the sleeping car and is instantly available at faucets in all sleeping car quarters.

The following newly-developed materials are used in the interiors of various parts of the cars:

Varlar wallpaper: This paper has a plastic coating applied on the outer surface so that it may be cleaned easily with soap and water.

V-Board: This is used in some of the dressing rooms for wall coverings. It also is a new material, a laminated plastic, .025 in. thick, with a hard, non-porous surface. The finished board is cemented in place on wood, metal or other smooth surface.

Es-Es material is used for floor coverings in the dressing rooms, toilets, vestibules, steward's section, etc., and also on a portion of the pasageway walls on the chair car. It is a combination of synthetic resins which has not yet been used commercially. It is made in a variety of colors to suit the styling of the train.

Nylon fabric is used for seat covering on some of the furniture. It has a hard surface which cleans easily.

Special lighting fixtures were designed to fit the individual styling of all compartments and all lighting is fluorescent, except for emergency and vestibule lighting.

The familiar "Watch Your Step" of railroad safety shows through illuminated glass steps at several places in the car interiors.

Hand rails for the safety of passengers are provided at the passageway ramps and at the Astra Dome stairs.

Still another safety feature of the train is a hot-journal detector system which operates throughout the train with indicator lights located inside the cars to inform train crew members about heat conditions in the boxes.

The G. M. Train of Tomorrow is finished with a glistening blue-green exterior on its sides and roof, punctuated by decorative moldings and sheathing below the windows which have a bright, silver finish.

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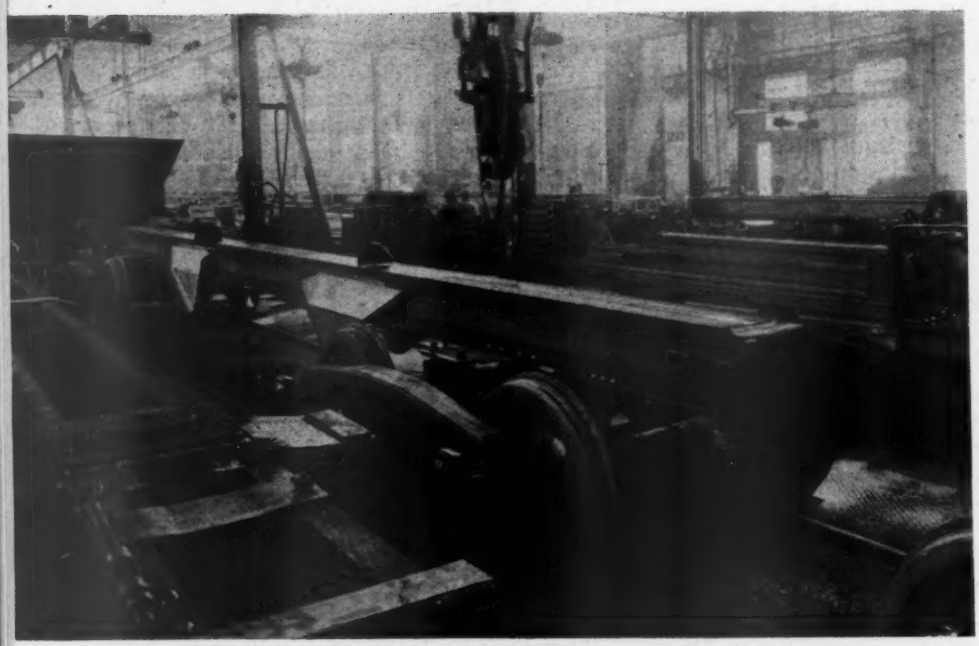
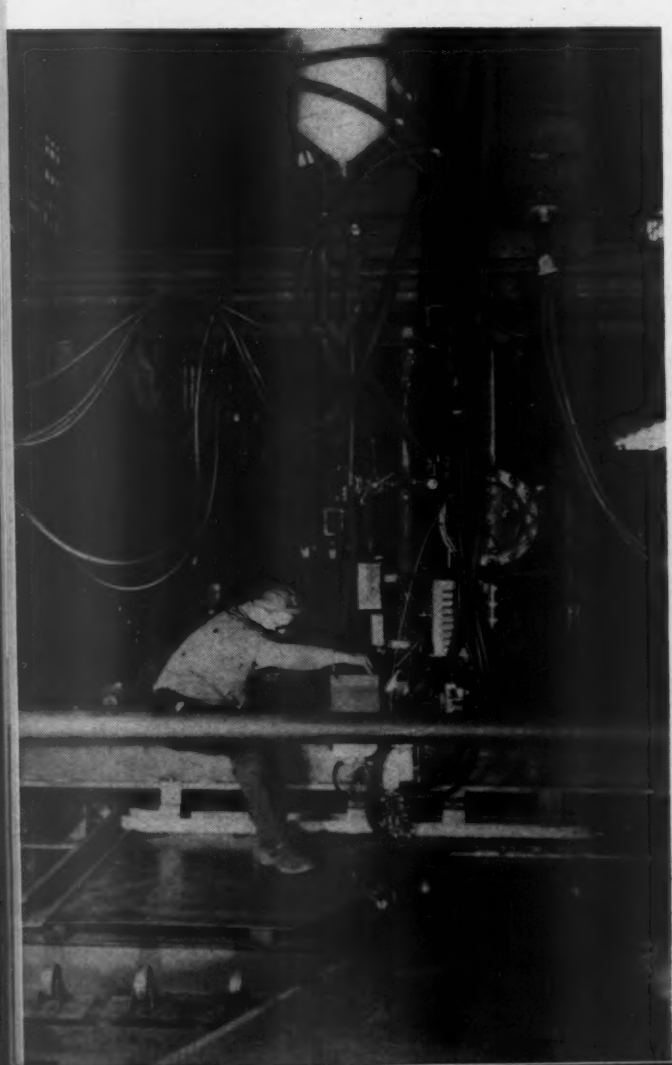
A four-unit, 8,000-hp. Diesel-electric freight locomotive built by Fairbanks, Morse & Co. for the Kansas City Southern

A.C.F. Assembly Line for W



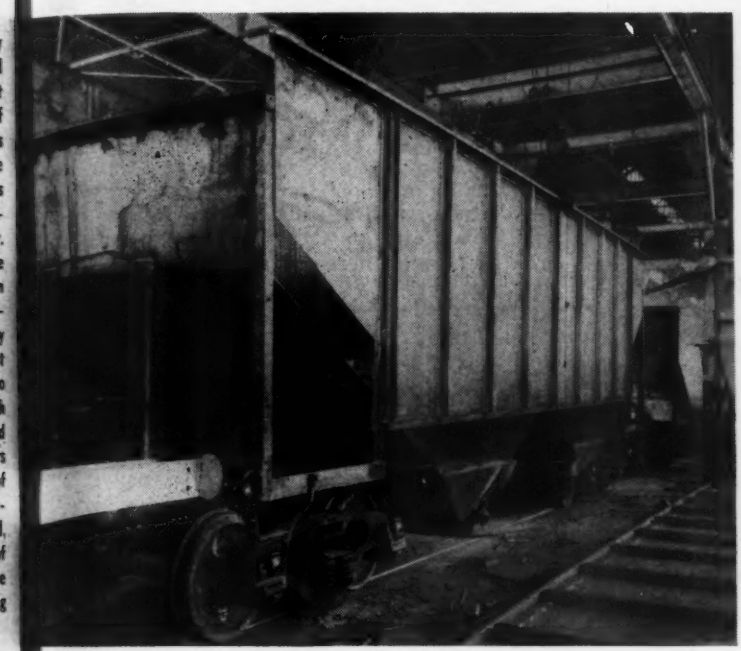
The American Car and Foundry Company has installed handling equipment and welding facilities at its Berwick, Pa., plant for the mass production of all types of welded freight cars. All large components of the car structure are delivered to the line as completely welded sub-assemblies after being fabricated on jigs and positioners designed especially for each part. Starting at the first position in the line where the center sills are mounted on the trucks, the cars are moved progressively through 14 locations before they move out of the shop ready for the last job of painting. For fitting the parts into place the assembly line is equipped with hand-controlled electric hoists suspended from an overhead runway that permits longitudinal and transverse movements of the hoists and with special holding devices. After all major parts are fitted, the cars run successively into each of three rotating positioners that tip the cars to an angle that allows all welding to be done in a down-hand position

Above—At the first assembly-line position the center sills with the draft gears and couplers installed are mounted on a pair of car trucks

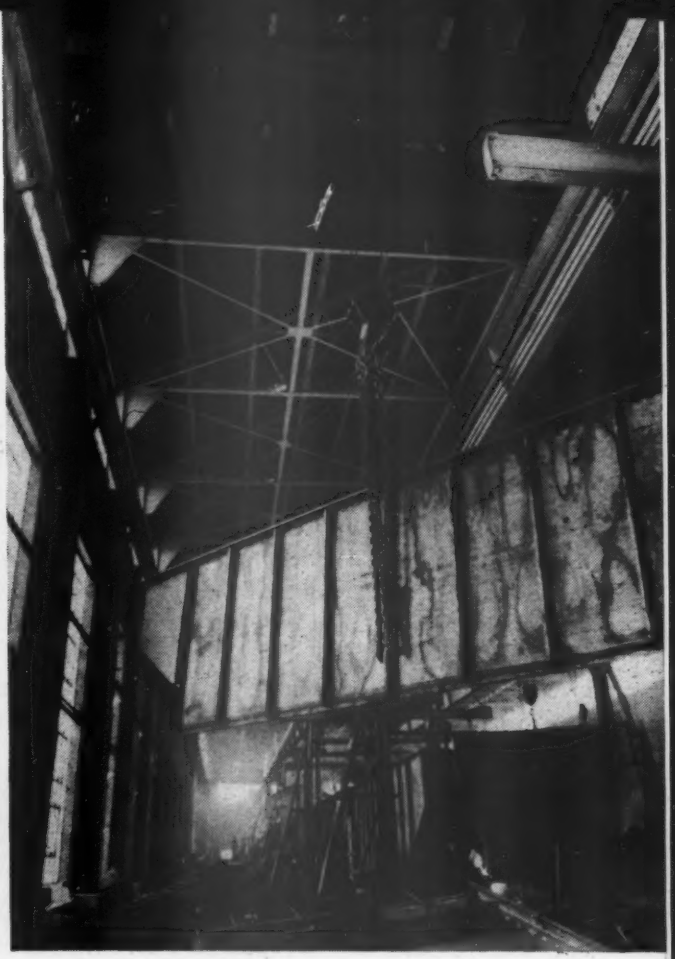


Above—Moved to the second position a hopper car begins to take shape as the end-slope, hopper and center-sill roof sheets are fitted into position—At the left the posts are being fastened to the car sides by an automatic welding machine while being held in a special jig-positioner equipped with rollers on which the car sides are moved as they are spotted for welding

Welded Cars



Here the car side is being lowered into place by the hand-controlled electric hoists at the sixth assembly-line spot



A completed car side is picked up from the jig-positioner by an overhead traveling crane and moved to the assembly line

Securely clamped and braced in the large rotating positioners a car is shown being finish welded in an upside-down position in the picture at the left and on one of its sides below—Similar in many respects to the unloading devices used to dump coal and ore at ship piers, the positioners are fitted with standard-gauge tracks and adjustable power clamping devices

EDITORIALS

How Many Spare Motors

A railroad which does all, or nearly all of its own traction-motor overhaul and repair work is usually a fairly large road with extended territory, and one which operates a considerable number of road locomotives. Other things which will influence a railroad to do, or not to do its own work, are convenience of outside repair shops, availability of good workmen, a shop foreman who is capable of conducting the work efficiently, an operating department which will recognize the importance of continuous shop operation, and a management which will plan a procedure and not be content to meet emergencies as they arise.

One example of shop planning concerns the question of how much to invest in spare motors. Too many mean too great an investment, and too few may mean failures, delays or excessive maintenance costs. If the railroad does all its own motor work at one point and ships motors to ten points where trucks are changed-out, it must first have 20 protection motors —two ready at each point. If the average time between overhaul periods is 12 months and it takes 30 days to put a motor through the shop, then the road must have one spare motor for each 12 in service. Since it takes time to ship the motors back and forth, additional spares are required, making perhaps one spare for each ten in service. And to keep it at this figure, shopping schedules must be set up and maintained to insure an even flow of work through the shop.

One road which operates on a schedule similar to this, claims that it can maintain motors at about 40 per cent of the cost of having the work done outside. Of course, to this maintenance must be added at least a part of the interest on the capital tied up in spare motors. Under many conditions, too, the outside shop can show that a railroad cannot hold its maintenance down to anywhere near so low a value. But the circumstance indicates that electrical maintenance can, in most cases, be considerably reduced and there is much to be accomplished by carefully planned maintenance procedure.

A Better Job At Lower Cost

One of the things which the majority of United States railroads are going to be faced for a long time to come is the economical maintenance and operation of steam power. This problem will be with them regardless of whether or not they prefer Diesel locomotives and how strong that preference might be. Such being the case it makes sense to begin to give careful consideration to the savings that can be effected through the use of improved servicing and repair facilities for steam power.

The use of straight-line servicing sheds for the servicing of steam locomotives, with the enginehouse reserved for periodic inspections, is a shining example of where a great deal of improvement can be made. A large proportion of the wasted man hours, as well as turntable and servicing delays, can be eliminated by having proper servicing facilities—facilities where, with one spotting, the locomotive can be washed, the fire cleaned, the tender filled with water and the boiler blown down if necessary,—facilities where inspection and minor running repairs can be given, and the locomotive lubricated from fixed fittings, all on an assembly-line basis without wasting the workmen's time and effort in carrying tools and servicing apparatus to the locomotive.

The advantages of assembly-line servicing facilities, and the fact that they are worth while, are perhaps best exemplified by the successful results on the Norfolk & Western. While such servicing facilities are but one of the many improvements in both the design and the maintenance of steam locomotives installed by the Norfolk & Western, they have certainly contributed their share to the excellent performance, low maintenance, and high utilization of modern N. & W. steam power. In passenger service, 4-8-4 locomotives with over 5,000 drawbar horsepower were maintained at an average cost of 13⅓ cents a mile over a period of 4⅓ years and were utilized 60 per cent of the time for an average of 15,000 miles per month on a railroad whose route does not lend itself to long high-speed runs. With the excellent straight-line servicing facilities, the 14 per cent of the total passenger motive power inventory represented by modern locomotives handles 50 per cent of the total passenger-car miles, and, in freight service, the modern 31 per cent of the freight power handles 69 per cent of the through gross ton miles.

Good facilities for servicing and maintaining steam power are a definite necessity if these functions are to be performed both economically and well. Without them full advantage cannot be taken of modern steam power any more than full adventage could be taken of Diesel-electric power if the Diesel locomotive were handicapped with out-of-date facilities. With modern facilities, servicing can be completed quickly, thereby increasing availability and utilization; it can also be done at a low cost because of the efficient use of manpower. When given facilities as modern as the power they serve, modern steam locomotives, like Diesel-electric locomotives, can perform a share of the total train

hauling greatly in excess of their ratio to the total motive power inventory.

What Is the Status Of Improvement Programs?

During the war the railroads were fortunate in having for once in recent years a volume of traffic that enabled them to observe the performance of their operating and mechanical structure at high output rates with the result that they not only learned many of the weaknesses of facilities and methods, but also learned many ways in which radical improvements might be made that should bring about permanent economy.

In spite of the continuing high pressure of more than five years of peak operations during the war there was hardly a railroad officer who did not consider it an important part of his duty to record for use in the postwar period the facts, while they were fresh in mind, concerning the improvements that could be made when times permitted a somewhat more leisurely and thorough study of the ideas.

This record, on road after road, is forming the basis of definite recommendations, on the part of mechanical and operating officers, to their respective managements, dealing with rehabilitation and replacement jobs all the way from a single machine tool or piece of shop or terminal equipment to projects involving the expenditure of several millions of dollars.

Although railroad earnings in the postwar period have been disappointing, there are very few roads that are actually short of cash, and carefully planned expenditures could very easily extricate them in part from the principal cause of their unsatisfactory net earnings—high labor costs in relation to the rate level.

That there have been tremendous increases in the cost of operations due to wage increases in both the railroad and the supplying industries is common knowledge. Not enough railroad officers and supervisors, however, realize the real effect of this increase on their every-day work. Directly related to actual expense increases is also the definite slowing down of the productiveness formerly expected of each unit of labor, time, or labor dollars.

A study of the operating- or mechnical-department statistics of the past ten years will reveal the most amazing things. It will reveal, for example, that the labor bill for maintenance of equipment operations has gone up about 100 per cent in the past six years. It will also reveal that the overall cost of materials has gone up from 40 to 50 per cent. On many roads the materials-cost increase has been held to lower levels than this because of the age-old tendency on the part of many railroad men to assume that to find a way to build something out of scrap, plus an old brake cylinder or two, is an economy of which to be proud. Little do they realize that they have not accomplished much by giving way to their ingenuity at the cost in today's labor market of the expenditure of several hundred man-hours and the ultimate result of adding one more piece of homemade equipment to the already overburdened shop inventory.

What these increases in labor and material costs really mean is reflected in the figures of one road, for example, on which "m. of e. expenses have gone up 53 per cent in nine years—locomotive repair expense has increased 64 per cent"—and this has taken place in spite of a 25 million-dollar investment in new power and servicing facilities. Nine years ago 62 per cent of the equipment-repair bill was labor, 38 per cent materials. Today, 68 per cent is labor and 32 per cent is materials.

Is the real significance of this trend understood? Isn't it obvious that the time has come when, in the interest of self preservation, mechanical officers and management officers must explore the whole question of labor-consuming facilities and quit trying to run a 1947 railroad with 1907-model shops and engine terminals?

One need only take a daylight train trip through almost any part of the industrial America to realize that the producing industries, such as automotive, electrical, machinery, etc., were foresighted enough to come out of this last war with new plant facilities which can now be utilized to turn out their products at an over-all expense in keeping with today's high production costs. The railroads have gone through two world wars and come out with what? Modern motive power and modern methods of operation, born of the experience of five years of doing the best job in all their history—and a several-billion-dollars' inventory of shops and terminals in which obsolete equipment and, perforce, antiquated methods are discounting as each month goes by much of the economy that could be realized if only some pressure were put on the improvement programs that have already been worked out.

What is the status of your modernization program? If your management cannot or will not see what obsolete facilities are costing on the m. of e. expense sheet because of your inability to reduce high-cost labor hours, possibly it is time to look for some outside engineering help, as other industries have, in analyzing your problem and recommending a solution.

The locomotive repair bill alone is railroading's largest single item of operating expense. Between 65 and 70 per cent of it is labor. The course to future savings should be clearly evident.

Test Train Will Try Out New Ideas

The constructive purpose back of the G. M. "Train of Tomorrow", described elsewhere in this issue, is to combine as many screened ideas as possible regarding desired passenger-car-design features of the future in a test train which can be tried out on various railroads

throughout the country to determine the practicability and public acceptance of these ideas. Four different types of cars are included in the train—namely, coach, sleeper, diner, and observation-lounge. Railway officers, transportation experts, the General Motors styling section, Electro-Motive engineers, and Pullman-Standard detail designers all contributed ideas to this train which was finally built at the Chicago shops of the latter company.

The most spectacular feature of the Train of Tomorrow is, of course, the Astra Dome which is built into the body and roof construction of each of the four cars and has already demonstrated its possibilities on an experimental car built by the Chicago, Burlington & Quincy, which was described in the *Railway Mechanical Engineer* of September, 1945. The way in which buff and pull, and the static- and dynamic-load stresses, are carried around the depressed floor section under the dome and in the side framing of the car body is exceptionally interesting. Three types of tests to determine the strength of this construction included a static load test, a torsion jacking test and an A. A. R. compression test and the 250 resistance-wire strain gauges, applied at various points on the car body are reported to have shown no excessive stresses. In the compression or squeeze test, a maximum load of 840,000 lb., applied on the center-sill ends, caused an average deflection between body bolsters of .485 in. which is well within the A. A. R. specification limits for this test.

Other new features in the Train of Tomorrow which deserve particular attention include the Thermopane glass application in the Astra Dome; in the method of train-heating temperature control; independent Delco-Detroit Diesel power plant on each car; a completely electrified diner; trucks with outside swing-hanger suspension, and advanced communication and recorded broadcast systems.

This is a striking list of new developments in passenger-car fittings and design. While some of the ideas may not prove adaptable to extensive general use they are definitely worth trying; history shows that the unusual of today becomes, in many instances, the commonplace of tomorrow. The Train of Tomorrow represents the combined knowledge and engineering skill of many industries and demonstrates the interdependence of one industry on another.

All They Needed Was a Handle—!

Any one who has ever had the experience of driving an automobile in the bitter cold of winter or the gusty rain of a summer thunderstorm and trying to close the window, only to discover that the handle was missing will be able to sympathize with the situation that developed at an important railroad terminal recently when an engineman "tied up the works" for three hours by refusing to take out a Diesel-electric freight locomotive on which the cab window was inoperative because the handle was missing and—to make matters worse—the storehouse bin was "fresh out of handles, too."

There's hardly a railroad man whose experience includes a stretch on either the day or the night shift at an enginehouse who could not work up some righteous wrath over what he considered the stubborn attitude of some engineman of his acquaintance. But before too much progress is made in criticizing the engine crew for being alert enough not only to know the rule book but to have a real sense of responsibility towards their job, it might be well to consider carefully the real implications of this seemingly important incident that prevented a railroad company from making profitable use of hundreds of thousands of dollars' worth of motive power and rolling stock for a period of three hours—not to mention disturbances caused by not getting a revenue-producing train of freight out of the yard on time.

Somewhere back of all this was, presumably, an engineman's work report (maybe two or three in succession) calling attention to the fact that on "Engine No. 8655, right side cab window inoperative—account handle missing". Handles have a habit of being missing or broken, quite frequently, and a smart enginehouse foreman would take it upon himself to check up on the local storekeeper once in a while just to make sure that a few handles—or other important items—were on hand all the time. Some men around terminals have also been known to be aware of the hiding place where things can be found in emergencies.

Then there was the matter of the inbound and outbound inspector who may have overlooked the fact that on modern locomotives it is quite difficult to open or shut a cab window, of certain types, without a handle and it should be more or less embarrassing to a lot of people to have an engine crew—and a half million dollars' worth of locomotives—just sitting around waiting for a two-dollar handle.

Yes, it's the small items that get overlooked that have the habit of appearing on the morning sheet as the ones causing the engine failures. It is the pin that comes out of the injector over-flow extension handle and permits the firemen to pull the handle through the cab floor when he wants to put water in the boiler. It is the bolt that drops off a clamp and lets the pipe vibrate until it breaks. It is the failure of some one to fill the grease cup or to do a good job in packing the journal box that is the cause of the hot bearing and the cut journal. These are the kind of defects that cause most of the delays. The broken rods and punctured fuel tanks not only are reported but they stare the terminal maintenance force right in the face when the locomotives arrive at a terminal—they are repaired.

Years ago one of the most famous books on railroading, "Jim Skeever's Object Lessons", was written by a man named John Hill and it was little things like the missing handle that formed the nucleus of each of these fascinating chapters. Even with modern power "Jim Skeever" and his object lessons still live on.

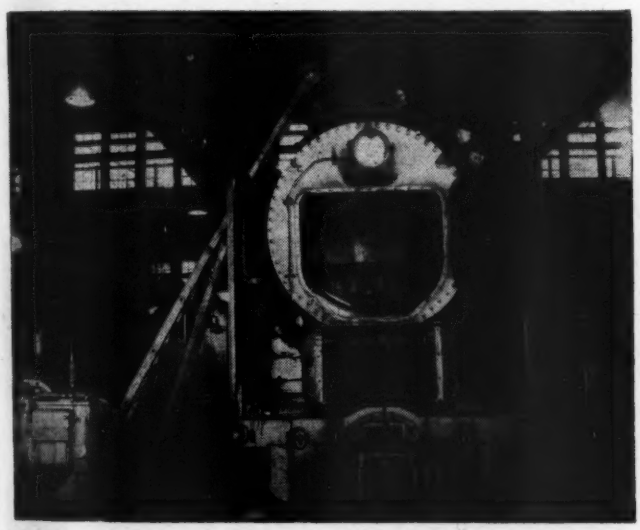
Enginehouse Maintenance Procedures on

New York Central Niagaras

Part II

Second and concluding installment of article on enginehouse procedure describes work done at typical quarterly inspection

A TYPICAL example of a quarterly inspection to one of these locomotives is that given to No. 5500 on March 5, 1947. At this time the locomotive had accumulated 166,114 miles since it was new. Its mileage from the last quarterly given on December 5, 1946, was 71,450. Thus this locomotive averaged nearly 24,000 miles a month despite the fact that its mileage was adversely affected by a short month (February) and by the coal strike. No. 5500 is similar to the other Class-S engines except that it is fitted with the Franklin poppet valve-gear system. The work is, therefore, typical of that performed on the entire group of these 4-8-4's. It differs only in so far as the inspection, repair and setting of the poppet valve gear differs from similar jobs on the Baker valve gear that is used on the other Class-S locomotives. A recondition quarterly, which is given at the end of every other three-month period, was performed with the single exception that the tires were not turned. This was not done because the tires were in good condition and it was decided to dispense with the tire turning at this time as the engine is scheduled to undergo dynamometer-car tests in the near future and will be tied up for outfitting long enough to permit the tires to be turned.



The cinder-cut stack was removed and replaced by means of a crane truck

The organization of manpower for quarterly inspection and repairs differs from the monthly boiler-wash line-up mainly with respect to the use and division of machinists. The boilermaker organization is identical with that for the monthly boiler wash. The extensive work done on the machinery, however, necessitates the employment of a larger machinist gang which is divided into the following groups:

One machinist and one helper handle stokers, hot-water pumps, injectors, boiler checks, blow-off cocks and the steam whistle.

One machinist and one helper are assigned to the Valve Pilot and rod work.

Two machinists and two helpers work on the rods, cylinder packing, valve setting and spring work.

Two machinists and two helpers handle wheel and spring work on the drop pit.

One machinist and one helper do the cab work and miscellaneous I. C. C. inspection work.

One machinist and one helper inspect and make repairs to the locomotive air brakes, air pump and brake cylinders.

One machinist and one helper make repairs to the tank brake rigging and inspect the draw bars.

One machinist and one helper work on force-feed lubricators, tight-lock couplers, cab cocks and various other general small jobs.

Extensive Repairs Performed

The extensive inspection and repairs made at these quarterly inspection periods is typified by the major items of repair performed on No. 5500.

The superheater units, steam pipes, exhaust pipes and nozzle were tested with 150 lb. per sq. in. water pressure and found satisfactory. The multiple throttle was washed out to remove the mud accumulation. The steam sepa-

Rolling the bronze bushing in the main driving rod

rators were cleaned. An examination showed the vertical swing checks to be in place and in proper condition. The exhaust-nozzle bridge was examined. This was not renewed as the use of Ni-hard tips largely eliminates the need for tip renewal. The ring blower and pipe lines were tested with steam at 15 lb. per sq. in and all the tips were cleaned. One cinder shield was renewed

To renew the left No. 2 tender spring the forward end of the 4-10-0 tender was jacked up, and the leading truck moved forward as far as it would go

because of wear. The continuous blowdown system was checked and found satisfactory.

A spare set of main and side rods was applied. These rods were taken from No. 6022 and had had all necessary repairs and tests made to them so that they could be immediately applied to any Class-S locomotive that required them. Repairs to these rods included new bronze bushings applied and rolled, which was done after the Magnaflux test showed the rods to be satisfactory. The rollers were cleaned and visually inspected for defects and all new fiber spacers installed to control the lateral. The axle roller bearings are adjusted at classified repairs only.

The oil in the rod roller bearings was renewed, the felt retainers checked, and all retainers renewed. The Timken split-type multiple-guide crosshead and its bolts were magnafluxed, and it was assembled with a .015-in. draw. The flame-hardened guides were checked for wear and reconditioned crosshead slippers, rebabbited at West Albany shops and machined to .020-in. clearance at Harmon, were applied. The wrist-pin roller bearing was set to zero clearance.

In the driving-wheel, engine-truck, trailer-truck and tender roller bearings the oil was drained, the box flushed with kerosene and the oil renewed. Settings on these bearing assemblies are performed at classified repairs only. All enclosure bolts on the driving-box end plates were checked and tightened. The main- and side-rod crank pins were cleaned and checked for defects.

The poppet valve-gear system, after examination and reassembly, was set by the dial indicator which is mounted on the outside of the cylinder assembly and shows where the various events of the steam cycle take place. The necessary adjustments were made by taking up on the camshaft connecting rod. The poppet valves were magnafluxed and all returned to service, none of the 12 exhaust nor 8 inlet valves requiring replacement.

All boiler checks were ground in. Shut-off valves were examined and had minor repairs made to them. The intermediate check valve on the feedwater-pump discharge line was examined and ground in. Examination was made to the seat and disc of the main steam-heat throttle valve at the turret and to the steam-heat regulator main and auxiliary valves. The steam whistle valve was ground in and the air operating valve examined, cleaned and lubricated. All cotter pins in the operating rigging were renewed. The low-water-alarm body was thoroughly washed out and the necessary openings reamed. The alarm was tested after the locomotive was fired up.

The steam gauge siphon pipe and connections were cleaned and the steam gauge cock reamed. The water-glass guards were removed and the glasses and gaskets examined for defects and cleaned. The water-column stud was checked for cracks and defects. All valves were examined and repacked, gauge lines annealed and the gauges tested. The fire doors were inspected but required no repairs.

The drawbar and safety-bar pins and holes were inspected for wear and all castings checked for the presence of cracks. The drawbar and safety bars were cleaned, whitewashed and hammer tested. The radial buffer castings and springs were examined and gauged, grease grooves and holes cleaned and the assembly regreased. All sand-trap nozzles were examined and cleaned.

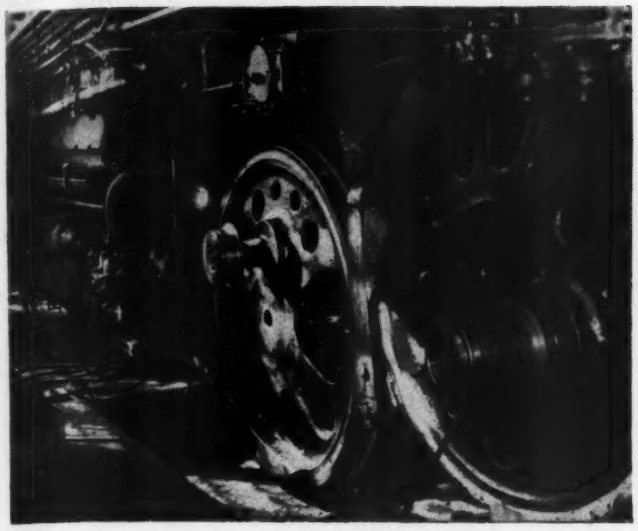
The cylinder packing and piston head were examined to determine the condition of the packing. Two new sets of sectional packing were installed. The piston rods and bodies were cleaned and magnafluxed. After reassembly the piston-rod nuts were hammer tested for tightness and the striking points and cylinder clearance tested.

The routine tender work performed consisted of

Inserting the No. 4 driving spring

washing out the tender cistern, cleaning the tank strainers, examining the tank hose thread connection at both ends, examining the splash plates and braces, checking the tank water-level-indicator piping and tightening all pipe connections. The rear coupler and draft gear were examined for excessive lost motion and defective parts. All metallic connections between the engine and tender were broken and examined. All new gaskets were applied and graphited and flexible connections lubricated.

A complete check was made of the Valve Pilot. The drive wheel was examined for wear and alignment and the condition of the bracket and bushing was checked. A check was made of the cam setting and the pencil



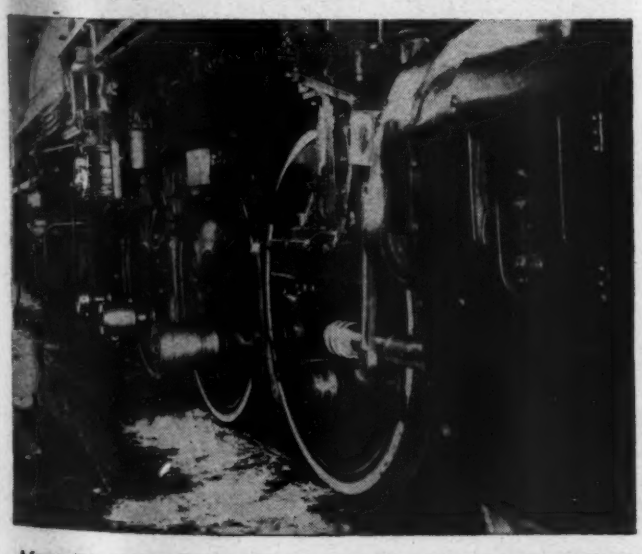
The rear drivers were dropped to remove the No. 4 driving springs

indications were compared with readings of the hands on the dial. The cam operating-rod turnbuckle and tumbling-shaft attachments were examined and the flexible drive chain removed, inspected and grease lubricated.

Inspection and repair of the live-steam injector consisted of checking the tubes for tightness, pitting and cutting, removing overflow connections to check tube tightness, and grinding and repacking the injector steam ram.

The centrifugal cold-water pump was checked and the packing renewed. The two steam nozzles were checked and found satisfactory. The brake shoe which is controlled from the hot-water pump to prevent the cold-water pump from overspeeding was checked and also found satisfactory. The gauge choke was examined and cleaned, and the gauge tested. Heads were removed from the reciprocating hot-water pump and the packing renewed. Its valves and springs were checked for $\frac{3}{32}$-in. lift.

The force-feed lubricators were washed out and all screens removed and cleaned. The wear and tightness of brackets, clamps and holding nuts were checked. The terminal checks were gauge-tested at 300 lb. per sq. in. The terminal checks and delivery nipples were examined. No settings are made at periodic inspections, all this work being performed at Class 3 repairs only.



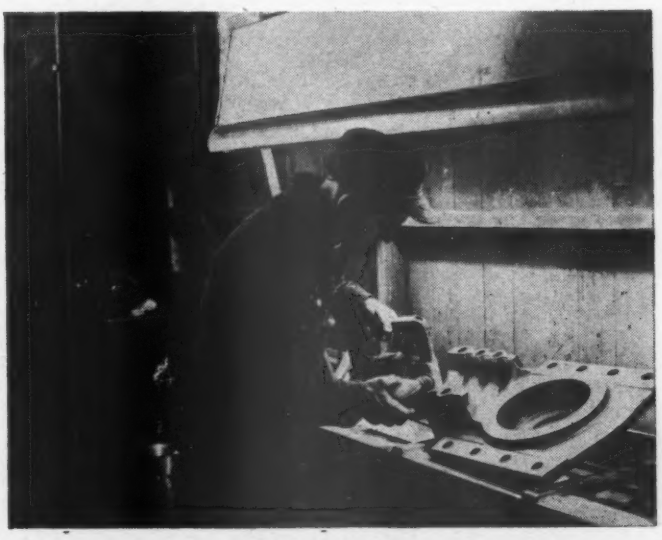
After the driving rods were removed all crank pins were examined and the roller bearing cups visually inspected

Additional Work on No. 5500

In addition to the regular quarterly inspections and repairs, certain other work was performed on the 5500. A new smoke stack and extension was applied and the front-end netting side panels renewed. New-style ash-pan-slide operating rods and pins were installed. Alterations to the front-end shield included four $3\frac{1}{2}$-in. holes drilled for access to the retaining bolts on the air cooler. The arch brick was renewed and all 177 4-in. flues were rewelded due to cinder cutting.

The right engine-truck spring, the Right No. 1 and Right No. 2 trailer springs, the Left No. 2 tender spring, and the Right No. 3 top tender coil springs were replaced. New driving-wheel springs included the Right and Left No. 4, Left No. 3 and the Right No. 1 and 2. Wheel work consisted of changing the No. 2 trailer wheels and the No. 3, 4, 5 and 6 tender wheels. These wheels had the treads worn hollow and were sent to the Harmon electric shop for reconditioning. The left trailer brake cylinder also required replacement.

At this quarterly several new or changed applications were also made. A pneuphonic horn was installed and the old style front driving-spring hangers were replaced with a new-style hanger having a greater lip depth. A timing device was installed to drain the air reservoir automatically. Clamps and U-bolts were applied to the water-scoop stand pipe in the tank. A portion of the hot-water delivery pipe over the left cylinder was removed and flanges applied to it to permit its removal for easier access to the lubricator terminal checks.



Magnafluxing a section of the split-type crosshead

Questions and Answers On Locomotive Practice

By George M. Davies

(This column will answer the questions of our readers on any phase of locomotive construction, shop repairs, or terminal handling, except those pertaining to the boiler. Questions should bear the name and address of the writer, whose identity will not be disclosed without permission to do so.)

Weight Distribution

Q.—Can weight be transferred from one side of a locomotive to the opposite side through the spring rigging?—R. E. M.

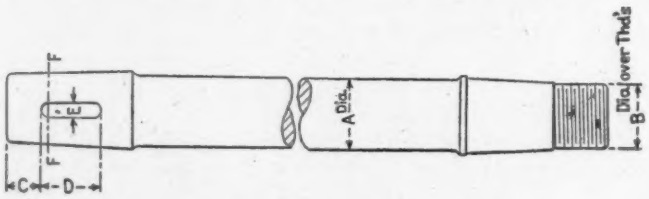
A.—The spring rigging of a locomotive distributes the sprung weight of the locomotive to the engine truck,

driving wheels and trailing truck wheels, and the distribution is determined from the longitudinal center of gravity of the engine. The transfer of weight from one side of the locomotive to the other through the conventional spring rigging would not be practical. The conventional spring rigging and equalizing system for locomotives is arranged as far as practical on the principle of the three-point suspension so that the engine will adjust itself to uneven track and, at the same time, have sufficient lateral stability to right itself after rolling to one side or the other.

Piston-Rod Diameter

Q.—What would be the minimum diameter of the piston rods for our Pacific-type locomotives? These locomotives have cylinders 23½-in. in diameter with a 26-in. stroke and carry 200 lb. per sq. in. boiler pressure.—

A.—The A. A. R. Manual of Standard and Recommended Practice gives the following formulas for computing the various piston rod sizes and sections:



Piston rod dimensions involved in computing the various sizes and sections

$$A = \sqrt{\frac{\text{Piston Thrust}}{6{,}600 \times .7854}}$$

$$B = 163 + \sqrt{\frac{\text{Piston Thrust}}{9{,}000 \times .7854}}$$

$$C = \sqrt{\frac{\text{Piston Thrust}}{2 \times 5{,}000 \times \text{Mean Diameter}}}$$

$$D \times E = \sqrt{\frac{\text{Piston Thrust}}{2 \times 10{,}000}}$$

$$\text{Area F-F} = \sqrt{\frac{\text{Piston Thrust}}{9{,}500}}$$

Substituting the values given in the question and solving for A we find the piston thrust for 23½-in.-diameter cylinders and 200-lb. boiler pressure = 86,750 lb.

$$A = \sqrt{\frac{86750}{6600 \times .7854}}$$

$$A = \sqrt{\frac{86750}{5183.64}}$$

$$A = \sqrt{16.73}$$

A = 4.09-in. minimum diameter of piston rod.

The standard diameter for a new piston rod for locomotive with 23½-in. cylinders with 200 lb. per sq. in. working pressure would be 4¼-in.

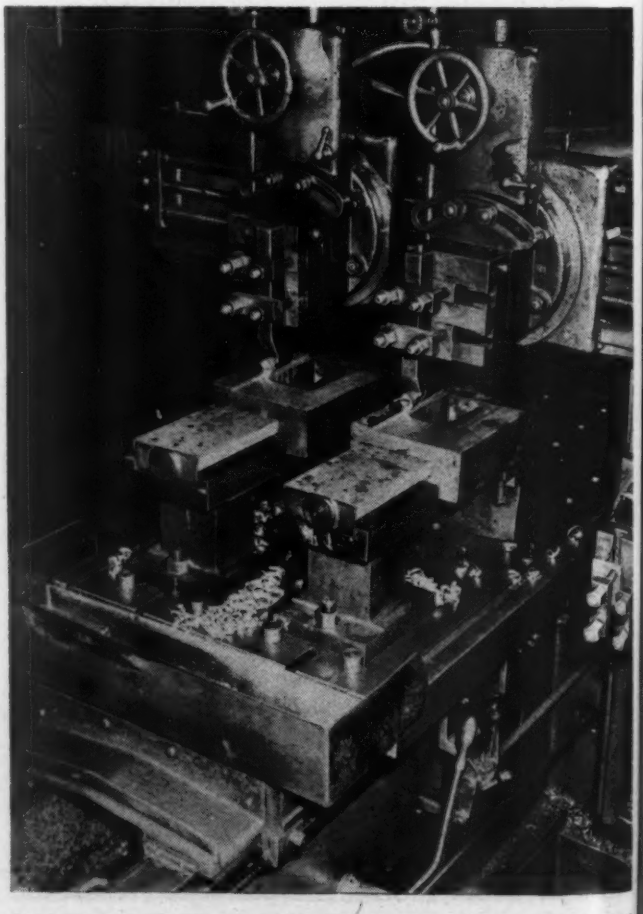
Gangway Clearances

Q.—Is there any limit to how close the back corner of the cab and the front corner of the tender can come together when a locomotive is passing through a curve or crossover?—M. I. V.

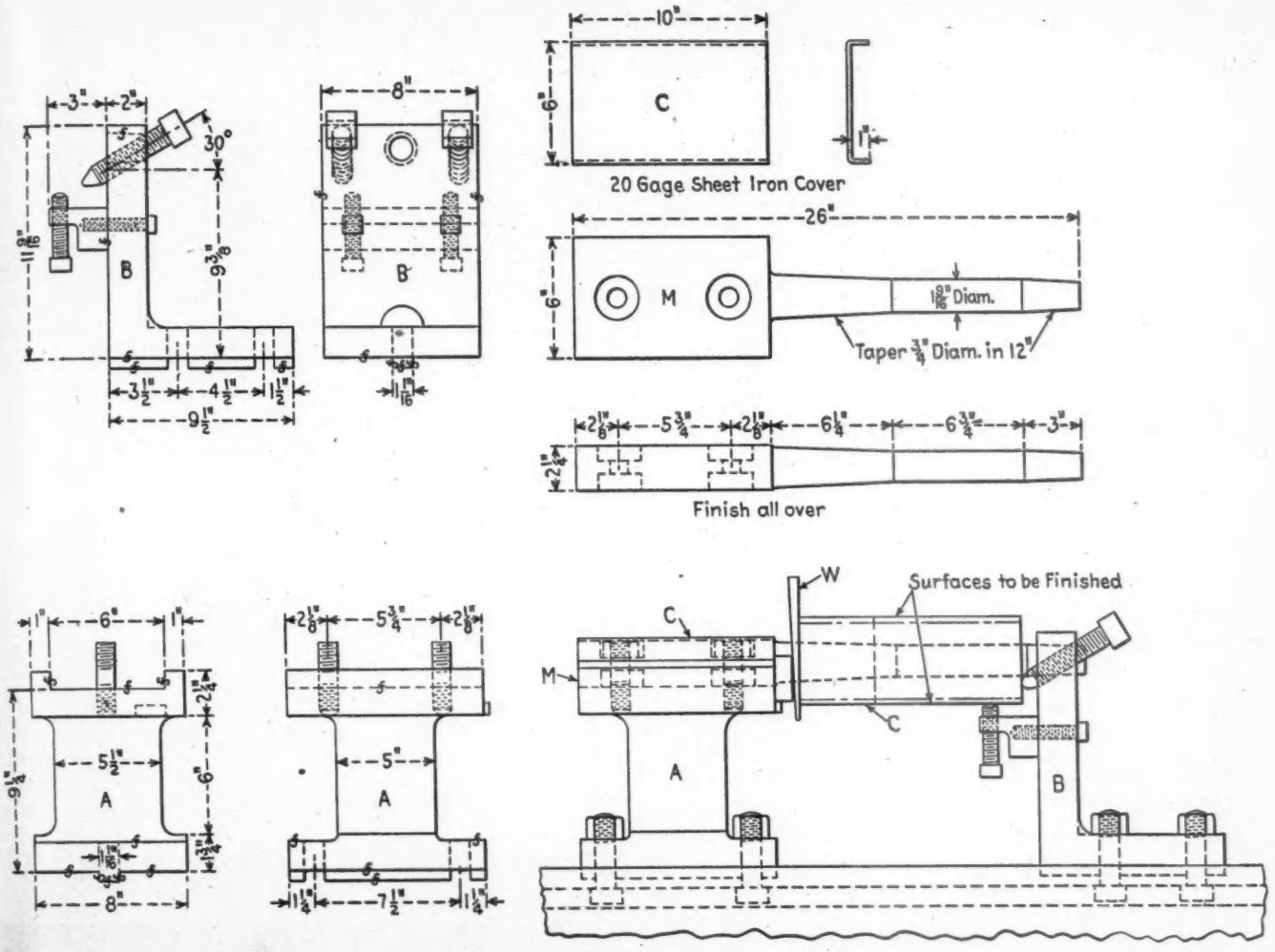
A.—Rule 152 (c) of the I. C. C. Bureau of Locomotive Inspection's Laws, Rules and Instructions for inspection and testing of locomotives and tenders and their appurtenances is as follows: The minimum width of the gangway between locomotive and tender, while standing on straight track, shall be 16 inches. This rule makes no provision for how close the cab and tender can come together while passing through or standing on a curve. What would limit this distance on a majority of steam locomotives would be the cab handles or handholds which are attached to the back corners of the cab. These handholds should have a minimum clearance of 2 inches under all conditions in order to comply with the Safety Appliance Standards for Steam Locomotives. It is often necessary to offset the cab handholds in order to maintain sufficient clearance between the handhold and the tender deck and the tender sill steps, when the locomotive is passing through a curve or crossover, due to the limited gangway between the cab and tender.

Machining Valve Crossheads

An improved method of machining the four outside surfaces of locomotive valve crossheads on a hydraulic, open-side, double-head planer at the Paducah, Ill., locomotive shop of the Illinois Central is shown in the illustrations. In making these crossheads, forged U-blocks of the proper size are first machined on the ends to the finish length, several pairs being machined at a time on a planer. The blocks are then drilled and reamed for the valve-stem fit which is done in one setting on a drill press, one crosshead at a time. The next operation is machining the outside surfaces using a special jig, which enables a more accurate job to be done in less time than formerly. Two jigs on the planer table permit two crossheads to be machined simultaneously.



Planing valve crossheads on special double-jig set-up at Paducah locomotive shop



Details of the valve crosshead planing jig which gives increased accuracy and production

The jig, as shown in the drawing, consists of a substantial holding stand, *A*, bolted to the planer table and recessed on the upper surface to receive the flattened rectangular end of mandrel *M* which is bolted firmly to it by two ⅞-in. studs and nuts. The mandrel proper is 1 9/16 in. in diameter and machined with one ¾-in. in 12-in. taper, corresponding to the valve-stem fit in the crosshead and a short taper end which bears in the outboard angle-bracket *B*, also bolted to the planer table. Bracket *B* carries two pairs of set screws, one for use in leveling the cross head prior to machining and the other to hold the crosshead firmly against the taper fit on the mandrel.

In operation, a crosshead is slipped over the mandrel up to the taper fit and the mandrel applied in the holding block and outboard support. The crosshead is leveled with the two lower set screws and the two downward slanted set screws tightened against the crosshead to hold it against backing off the taper fit.

With the crosshead in this position, the top and both vertical outside surfaces are machined. With the mandrel remaining in place, the set screws are backed off and the crosshead loosened from the taper fit by driving down wedge *W* with light blows of a hand hammer. The crosshead is then revolved 180 deg., set screws retightened and the other side machined. During both of these machine operations, a sheet iron cover, *C*, is applied over the flattened end of mandrel, *M*, as a protection against accidental marking or defacing of the upper surface of the mandrel.

On completion of the machining operations described, the inside surfaces of the valve crossheads are finished on a planer, nine crossheads at a time. The taper pin holes are then being drilled and reamed on a horizontal boring mill. The 1¾-in. radius grease pockets are cut on a milling machine, two milling cutters being used at a time so that two pockets are cut at once. The keyway is drilled and finished to size, the 3/16-in. radius at the end of the stem fit being cut on a drill press with suitable cutter.

Alemite pockets and holes are drilled on a drill press and pockets are then tapped. After the operations mentioned above, the crossheads are polished and bearing surfaces are flame hardened.

Air Brake Questions and Answers

The 24 RL Brake Equipment for Diesel-Electric Locomotives—Parts of the Equipment—Locomotive A Unit

540—Q.—Where is the equalizing piston valve portion located? A.—Equalizing piston valve portion 75 is attached to the side of the filling piece portion by four cap screws.

541—Q.—What is it's function? A.—To control the rate of brake pipe reduction in First Service and Service positions of the brake valve handle.

542—Q.—How are the chambers above and below the

equalizing piston 77 connected? A.—The chamber above the piston is connected to the equalizing reservoir, and the chamber below the piston to the brake pipe.

543—Q.—Explain the operation in Release and Running positions. A.—In Release and Running positions of the brake valve handle both chambers charge equally so that the piston and its operating lever *79* are balanced and spring *83* holds equalizing discharge valve *82* seated, closing the brake valve exhaust.

544—Q.—How is an automatic brake pipe reduction accomplished at a controlled rate, regardless of train length? A.—When the brake valve handle is moved to Service position, pressure above the piston and in the equalizing reservoir is reduced through the preliminary exhaust port of the automatic brake valve. Brake pipe pressure in the lower chamber then raises the piston; operating lever *79* is carried with it, the short end of the lever rotating around pin *80* thereby engaging the collar and unseating equalizing discharge valve *82* past which brake pipe air escapes to the brake valve exhaust. When the brake pipe reduction equals that made in the equalizing reservoir the piston moves downward, permitting valve *82* to close and terminating the brake pipe reduction. This feature thus accomplishes an automatic brake pipe reduction at a controlled rate regardless of train length.

545—Q.—In this position, does the engineman reduce the brake pipe pressure? A.—No. The engineman makes the desired reduction in equalizing reservoir pressure and the equalizing portion automatically reduces the brake pipe pressure a corresponding amount.

546—Q.—How is the pressure above the equalizing piston reduced in First Service? A.—In First Service the pressure above the piston is reduced at a controlled rate into the reduction limiting reservoir.

547—Q.—What is the position of the maintaining valve 87 at this time? A.—The maintaining valve is closed, being held on the seat by spring *88*.

548—Q.—To what is the chamber beneath the piston connected? A.—To feed valve pressure through the rotary valve.

549—Q.—Describe the uniform brake pipe reduction feature for long trains. A.—If brake pipe pressure reduction occurs at a faster rate than equalizing reservoir reduction, the higher equalizing reservoir pressure above the piston moves the latter downward into contact with the spring backed stop *89* at the end of the piston stem, depressing operating lever *79* and unseating maintaining valve *87*. Sufficient feed valve air is supplied past the valve to limit the rate of brake pipe reduction to that of the controlled equalizing reservoir reduction. This is the uniform brake pipe reduction feature for long trains.

550—Q.—In the event that during recharge of the brakes, equalizing reservoir pressure exceeds brake pressure, what happens? A.—During recharge of the brakes should the equalizing reservoir pressure exceed brake pipe pressure by approximately 2 lb., the resistance of both maintaining valve and piston stop springs (*88* and *90*) is overcome and piston *77* moves to its lower position, uncovering ports in the piston bushing leading to the brake pipe chamber. This allows the excessive equalizing reservoir pressures to be reduced by air flowing into the brake pipe until the pressures equalize.

551—Q.—Where is the First Service cock portion located and what is it used for? A.—The First Service cock portion *41* attached to the side of the filling piece portion *25* with two cap screws *51* is used for cutting out the First Service feature when desired.

552—Q.—What does it consist of? A.—First Service cock portion consists of the body *41*, cock key *42*, spring *43*, handle *45*, ball check *46*, check valve *47* and check valve spring *48*.

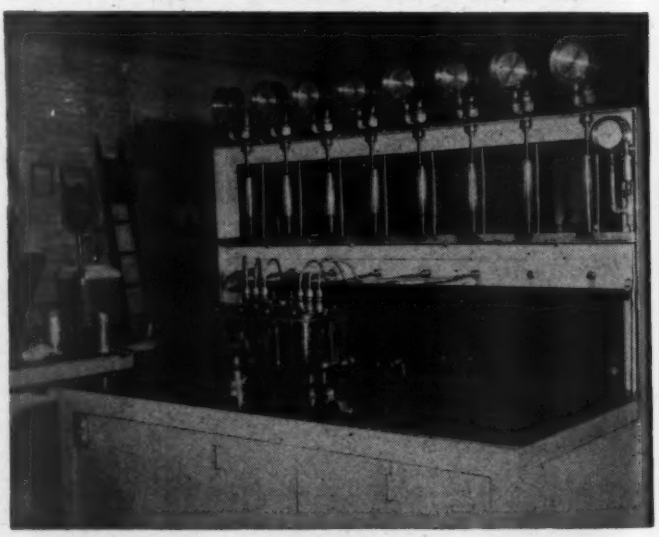
553—Q.—How does the cock key operate? A.—Cock key *42* cuts in the First Service feature when the handle is turned to the position marked In and cuts out the First Service feature when the handle is in the position marked "out."

554—Q.—With the First Service feature cut out, and a reduction on top of a safety control application is desired, how is this accomplished? A.—Ball check *46* and check valve *47* provide the means of reducing the limiting reservoir pressure when such a reduction is desired.

555—Q.—Where is the pipe bracket portion located and what is its purpose? A.—The pipe bracket portion *2* attached to the filling piece portion is used for connecting all pipes to the brake valve. Most of the pipe connections are made to the pipe bracket face beneath the floor sheet by means of Wabcotite fittings.

Lubricator Testing Apparatus

All types of mechanical lubricators as well as feedwater pump lubricators and main air-pump lubricators are tested on a rig designed and constructed by the Reading shop forces at the Reading, Pa., shops. Mechanical lubricators are driven by a 440-volt a.c. motor of 1 hp. through suitable belts and linkages. Other lubricators



The bench for testing lubricators with a six-feed mechanical lubricator being tested—The mechanical counter is shown just to the right of the lubricator—The gauge at the upper right is the 160-lb. gauge for testing air-pump lubricators

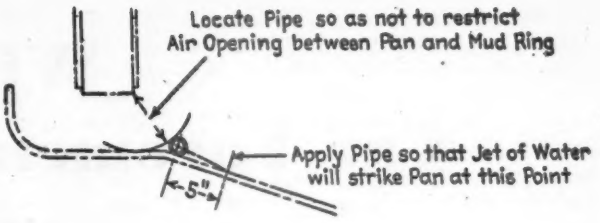
are operated by air impulses or steam, depending upon which medium is employed to actuate them in service. Oil delivery is measured in eight 100-cc. glass burettes, while the number of strokes is noted by a mechanical counter. Eight 1,000-lb. per sq. in. gauges are mounted near the eight burettes for checking and setting the discharge rates and pressures of the individual feeds.

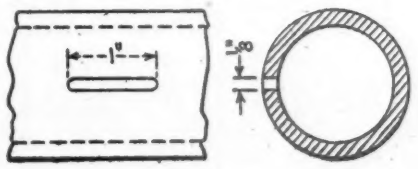
The feeds on the mechanical lubricators are adjusted and the discharge pressures set at 350 lb. per sq. in. at Class 3 and Class 5 repairs. The feed discharges are connected to the 1,000-lb. gauges through flexible tubing, and the drive shaft is connected to the operating linkage. One end of a piece of tough twine is fastened to the lubricator drive shaft and the other end to the mechan-

ical counter. The motor is started and each individual feed regulated for pressure and rate of flow.

Main air-pump lubricators are checked for capacity and to see that they operate satisfactorily on an air pressure not exceeding 30 lb. per sq. in. To attain the necessary air impulses a rotary valve is used in conjunction with a C-6 or C-8 feed valve from a locomotive air-brake system. The air is reduced by this feed valve to less than 30 lb. per sq. in. in the reservoir, after which it passes to a rotary valve having one inlet and one exhaust port.

To create air impulses similar to those generated by the air pump in service, the valve is belt driven by the electric motor at a speed equivalent to 100 strokes per minute. This speed is checked by the mechanical counter which, for this test, is operated by a small air cylinder acting through a lever connection to the counter. One of the two 160-lb. per sq. in. gauges is mounted on the low pressure side of the feed valve to check the operation of the pump to see that it operates satisfactorily on less than 30-lb. per sq. in. pressure. The other 160-lb. gauge is used in testing the feedwater pump lubricators to measure the steam pressure.


Locate Pipe so as not to restrict
Air Opening between Pan and Mud Ring
Apply Pipe so that Jet of Water
will strike Pan at this Point
5"



Above: a cross section of the application of the slotted pipe—
Below: Detail of the slot in the pipe

Locomotive Boiler Questions and Answers

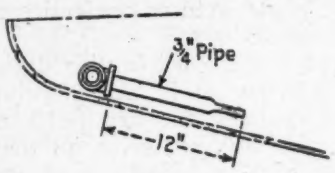
By George M. Davies

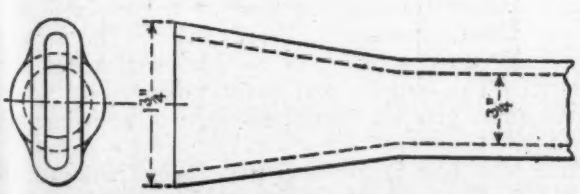
(This department is for the help of those who desire assistance on locomotive boiler problems. Inquiries should bear the name and address of the writer. Anonymous communications will not be considered. The identity of the writer, however, will not be disclosed unless special permission is given to do so. Our readers in the boiler shop are invited to submit their problems for solution.)

Ash-Pan Flushers

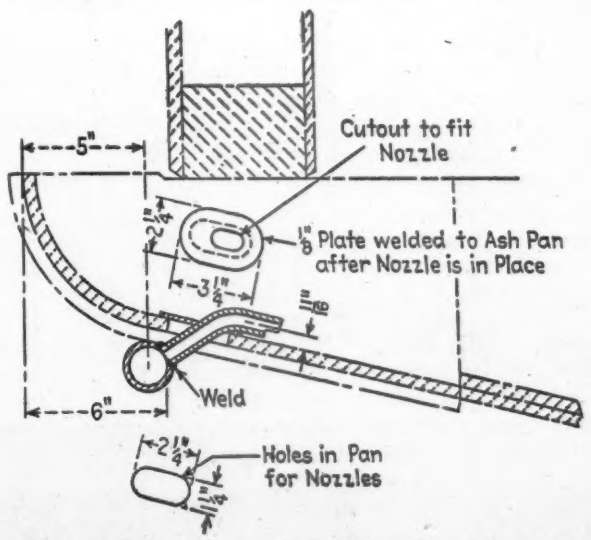
Q.—On our Pacific-type locomotives the side wings of the ash pan incline slightly for a distance of about 2½ to 3 ft. and fail to clean themselves of ashes en route. We contemplate applying ash-pan flushers to these engines and would appreciate any data you may have on them.—M. F. L.

A.—There are various methods of applying ash-pan flushers to locomotives, the method of application being determined to a great extent by the design of the ash pan and the grates on the locomotive to which the flusher is to be applied. An ash-pan flusher generally consists of two pipes, one on each side of the ash pan with suitable openings or nozzles for flushing the pan. Hot water is taken from the firebox 24 to 30 in. above the firebox ring using a quick-acting valve operated by a lever from the cab. The flusher pipes are located on either the inside or outside of the ash pan and run the entire length of the pan where necessary. Here are three typical applications.





Above: Application of ash pan flusher where nozzle spreaders are substituted for slotted holes in the pipe—Below: Detail of the nozzle



How the flusher pipe may be located outside of the ash pan

One type has the pipe located inside of the ash pan and uses a series of slots in the pipe for flushing the pan. This is the simplest form of application and should be used only where there is an ample air opening between the firebox ring and the ash pan. The pipe on the second type is located inside the ash pan in the same manner but nozzle spreaders are used in place of the slotted holes in the pipe. With the use of the nozzles a better distribution of the water for flushing the pan can be obtained. The third type has the flusher pipe located outside of the ash pan, with the nozzles passing through the pan. This arrangement does not restrict the air opening. The nozzle illustrated is designed to act as a spreader while also directing the force of the stream against the ash-pan sheet, washing it effectively, and is particularly effective where large amounts of ashes have to be moved down the sheet.

The spacing of the slots or nozzles is best determined by making a trial application. The size of the pipe is determined by the number of nozzles used.

With the Car Foremen and Inspectors

Air Hose Reclamation

A STRAIGHT line assembly is used at the Reading, Pa., shops of the Reading for reclaiming air-hose couplings and nipples, and for returning the used rubber hose to the factory as scrap rubber. The line is approximately 40 ft. long and the entire assemblage requires an area of about 40 ft. x 20 ft. The following operations are performed in sequence and as the couplings pass through the line:

1. The clamp bolt is cut and the clamp opened.
2. Both end fittings are removed simultaneously.
3. A small, permanently mounted air motor reams the coupler set.
4. Couplings are assorted, gaged, repaired, air-tested for leakage at 100-lb. per sq. in., grooves cleaned and new gaskets applied.
5. Clamps are checked for cracks and straightened for reapplication if no cracks exist.
6. Both end couplings are applied to a section of new hose.
7. The repaired clamps are then located at the proper position on the hose and the bolt and nut applied through a power-driven flexible spindle.

The first step in the sequence of operations is the cutting of the clamp bolt to save the time that would otherwise be expended in unscrewing the nut, which it frequently frozen to the bolt with rust. The use of the vertically mounted, power-operated shears enables the workman to complete the removal of the clamp

Device for testing the tightness of the connection between couplings

assembly in a matter of seconds. The hose is held firmly with both hands and the bolt inserted between the blades of the shears. Depressing the foot pedal operates a rotary valve to admit air to the power cylinder, moving the piston and closing the shears on

Seats fittings are reamed on this permanently mounted air motor

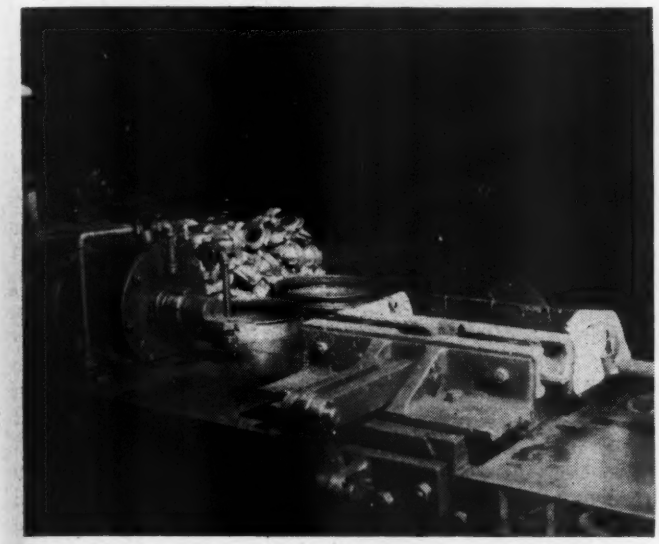
the bolt through a system of levers. Upon completion of cutting the bolt the foot pedal is released, permitting the air to be discharged from the cylinder. A spring on the top of the piston returns the entire mechanism to the starting position.

The power supply for the bolt-cutting device is compressed air at 110 lb. per sq. in. acting within an 8-in. air cylinder. The cylinder, the foot pedal and rotary valve, the shears, and the fixed pivot for the operating linkages are bolted to 3-in. by 4-in. angle irons which are fastened to the bench and form the main supports. The piston rod is connected by a clevis to the operating linkages which transmit the force to the movable blade of the shears through a keyed shaft. The linkages were constructed from ½-in. by 2-in. sections of scrap material. The lengths and pivot points were so designed as to give an overall leverage of approximately 10 to 1.

After the bolt and clamp have been removed, the hose assembly is inserted into the coupling remover, the main parts of which are four castings, three air cylinders, and suitable operating and control mechanisms. Two of the four castings serve as a chuck to grip the hose itself and are ribbed to provide a firm hold on the hose. One has a fixed mounting and the other moves transversely with respect to the bench. It is power-operated by an air cylinder located under the bench. The movement of the movable casting is at-

tained by a lever system and controlled by a foot-operated rotary valve.

The two end castings move lengthwise through a direct connection with the piston rods of the two operating cylinders. They are each one-piece castings, symmetrically ribbed on the sides to engage the protruding flange of the respective coupling. A foot pedal, separate from that used to operate the gripping castings, actuates a separate rotary valve to admit air to the cylinders for



Apparatus for applying reconditioned fittings to new rubber hoses. Different sized chucks are used for clamping the varied sizes of hoses

pulling the couplings loose from the hose. As the couplings are broken loose they fall through the open bottoms of the castings into two collecting cans, one located at each end of the puller, for each type of fitting.

The three cylinders employed to operate the coupling remover were former 8-in. air brake cylinders. The two that pull the coupling loose had their stroke reduced to 7 in. The transverse cylinder was adapted for holding the hose by laying out the linkage to give the required leverage for the proper-length movement. All cylinders are double acting, and remain in the last-attained position until further actuated by the operator. The two coupling-puller cylinders are simultaneously actuated by their rotary valve. Independent operation of either pulling cylinder may be had by the use of the cut-out cocks installed on each cylinder.

The used rubber hoses are placed in the binding machine until about fifty have accumulated. The group is then compressed into a bundle and bound with twine while under compression for shipment to the factory as scrap rubber.

The hose binder is located on a separate mounting. The base is a section of 12-in. channel iron; the four legs are 3-in. brake beam channels welded to the base. Scrap tool steel, 1½ in. square, was used for the binder itself to prevent springing or a permanent set. The tool steel was formed into an overall shape approximating that of an ellipse. There are two halves, which overlap each other by about two inches on the top sections and six or eight inches on the bottom rungs. The half of the binder away from the cylinder is bolted to the stand through a ½-in. thick piece of steel angle reinforced by a ½-in. plate welded to the angle to form a triangular support.

The movable portion of the binding section slides along the base. It is prevented from lifting or from becoming overly tight by a shoulder bolt and washer which fit into a slot in the channel-iron base. The movement of this portion is attained through direct connection to the piston rod of the operating cylinder. Control of this 8-in. by 10-in. cylinder is by a throttle-operated rotary valve. Air may be admitted to either side of the piston to effect operating or closing of the binder as desired.

The next step for the couplings that were deposited in the cans by the coupling remover is the reaming of the seat with a small foot-pedal-operated air motor mounted on the bench. Following the reaming of the seat, rough spots are hand filed and the couplings are assorted and gauged. Those that require minor repairs are fixed. Before being applied to new hoses, all couplings are tested under water with an air pressure of 100 lb. per sq. in.

To make this test, the reconditioned coupling is connected to a blanked-off dummy coupling. A small bolt on the dummy is used to apply the force necessary to seal the coupling against the rubber gasket of the dummy. With this fixture applied to block the air that would normally flow through the opening when the couplings are connected between cars, the air pressure is applied by a hand-operated air cock. The two-coupling assembly is immersed in the vat of water by raising an external handle that is connected to the assembly and is pivoted on the top of one side of the vat. Any leakage is noted by the appearance of bubbles in the water.

The couplings that have been repaired and tested, and clamps that were straightened after having been found to contain no cracks, are applied to new lengths of rubber hose. The operation is performed in a device roughly similar to that for removing the fittings from the old hoses. The hose is held between two castings. In this case, however, the shape of the cross section of the two castings when fitting snugly together is that of a square from the center of which a circular section has been removed. Different-sized castings are used for different-sized hoses.

The chuck operating mechanism for power-gripping the hose is the same as the one constructed for the coupling-remover assembly and comprises a foot pedal and rotary valve, an air cylinder, and a suitable con-

Construction of the bolt tightener used for tightening the clamp bolt, the final step in the assembly line reclamation

necting linkage. To force the two types of end fittings into the hose, two different-shaped connections are applied to the two piston-rod extensions. Both connections are fastened by packing-gland nuts to permit their being easily changed to accommodate fittings of different-sized hoses. The extension for the coupling that

connects the train line between the cars has a shape similar to that of a mating coupling to give a steady support to the coupling while it is being guided by hand into the hose.

The operation of the fitting applicator, like its construction, is much the same as the fitting-removal assemblage. The transverse-motion foot pedal is depressed to grip the hose in the chuck. After both inside ends of the hose are coated with rubber cement or Armstrong linoleum cement, the second foot pedal is depressed to operate the two cylinders in unison. The two pistons move toward each other and force the two fittings securely into the hose, their entrance being guided by the internal round surface of the chuck.

The final operation in the reclamation of air hoses is the tightening of the bolt on the clamps. When the

The binder compresses groups of scrap rubber hose for bundling and shipment

clamps are located in their proper position, the nut is held opposite one opening and the bolt inserted through the opposite hole. Tightening of the clamp is done by turning the bolt into the nut with a power driven screw driver.

Power to operate the clamp tightener is supplied by a ½-hp. electric motor driving the bolt turner through a double-reduction pulley system. The motor runs continuously while the clamps are being tightened. The bolt turner and its socket wrench are engaged as necessary to tighten the bolts by raising the top pulley into contact with the driving belt. This is done by a foot

Cutting the clamp bolt is the first step in the reclamation of the air hoses

Apparatus used to remove both end couplings simultaneously

lever mounted on a length of ¾-in. pipe which is bent into the shape of an automobile crank. It is pivoted at a point about two-thirds of its length from the foot pedal. Depressing the foot pedal results, therefore, in lifting the driving pulley about half the distance the pedal is lowered. While being raised the pulley is kept in line with the belt by an arrangement that functions in the manner of a locomotive crosshead and guide. A 1½-in. diameter shaft is connected to the end of the ¾-in. pipe opposite the foot pedal. Two keys prevent rotation of this shaft and restrain it to true vertical motion. The pulley is raised and lowered with the shaft through a U-shaped mounting which connects to the shaft and which supports the pulley in bearings in the sides. An adjustable clamp bolted to the shaft limits the maximum height to which the shaft may be raised by contacting a stop on the frame. In this way the tension of the belt, and consequently the friction between it and the pulley, is limited to the point where slippage will occur before enough torque develops to strip the threads.

The shaft of the pulley drives the bolt turner through a flexible shaft splined to permit telescoping. Near the driving end it passes through a leather-lined eyelet rest. Beyond the eyelet is an aluminum handle within which the socket revolves. The handle does not turn, but serves as a guide to the socket in contacting the bolt head.

Coupler Knuckle And Lock Standards

In a circular letter, dated July 2, the secretary of the A.A.R. Mechanical Division stated that the General, Coupler, and Arbitration committees have concurred in the addition of the following note under Par. (c-1) of Interchange Rule 3.

"Note.—Effective July 1, 1947, the E-50 coupler knuckle and E-40 coupler lock in high tensile steel, normalized and tempered, became the standard for the Type E coupler. However, to permit the use of couplers equipped with former standard Grade-B steel knuckles and locks which were purchased and manufactured prior to the above date for use on new cars (the construction of which has been unavoidably delayed), such couplers may be applied to new cars outshopped prior to January 1, 1948."

Protect Car Wheels While Being Painted

The Arbitration Committee also reported receiving additional complaints of difficulty being experienced in properly controlling cars (especially when loaded)

through car retarder devices in cases where the wheels have been newly painted.

This subject was before the committee at a recent meeting and it was ruled that damage to car due to inability properly to control them when moving through a retarder device on account of rims of the wheels having been newly painted, where no failure of the retarder itself or mishandling of equipment as a result of incorrect information being furnished to retarder operator is involved, should be the responsibility of the car owner providing a Rule 44 combination is not reached.

The committee instructed the secretary to direct attention to this matter again and to suggest that arrangements be made to protect both outside and inside surfaces of wheel rims by metal shields or other device while painting operations are in progress.

Decisions of Arbitration Cases

(The Arbitration Committee of the A. A. R. Mechanical Division is called upon to render decisions on a large number of questions and controversies which are submitted from time to time. As these matters are of interest not only to railroad officers but also to car inspectors and others, the Railway Mechanical Engineer will print abstracts of decisions as rendered.)

Joint Evidence Per Rule 12 Is Final

About July 1, 1944, an EORX car was damaged in an accident on the tracks of the Terminal Railroad Association of St. Louis. The car was repaired and billed empty to the car owner, the Cities Service Oil Company, at Ponca City, Oklahoma. The car owner submitted a joint inspection form, dated September 14, 1944, to the Terminal Railroad Association of St. Louis and requested a defect card for a tank head improperly straightened and a center sill improperly spliced. The joint inspection form carried the following notation, "The inside splice plate was omitted and the sill fracture was not welded as required by Interchange Rule 22." Claiming the repairs were properly made the Terminal Association of St. Louis refused to issue a defect card. It stated further that the notation was not on the joint inspection form when the form was originally prepared and signed by an Atchison, Topeka & Santa Fe inspector at Ponca City. The Cities Service Oil Company maintained that the joint inspection certificate should be considered final evidence that the repairs were not properly made.

In a decision rendered November 7, 1946, the Arbitration Committee said, "Joint evidence obtained per Rule 12 is final. The contention of the car owner is sustained." In a notation to the decision the committee said that an investigation developed the fact that the statement added to the joint evidence was incorporated in the document after an actual subsequent joint inspection was made by the signers of the original form. *Case 1819, Cities Service Oil Company versus Terminal Railroad Association of St. Louis.*

Repair Record Not Made Incorrect by Repair Card

On November 12, 1944, the Chesapeake & Ohio applied two second-hand Miner A-2-XB draft gears to the A and B ends of Charleston & West Carolina car 8218. On August 25, 1945, the Chicago & North Western removed the draft gear at the B end because the casing was broken and showed the gear to be a Peerless H-1. The W. & W. C. maintained that the repair card of the C. & N. W. acted as joint evidence per Rule 90 that a Miner draft gear was not applied by the C. & O. as the car had not been on home rails between the two dates and no other repair cards had been received covering an exchange of draft gears. The C. & O. claimed that in the interval of nine months and 13 days the draft gears could have been changed and no billing repair card furnished the car owner. It also stated that it is not reasonable to assume that the C. & O. repair forces could not distinguish correctly between the Miner and Peerless draft gears.

In a decision rendered November 7, 1946, the Arbitration Committee said, "The principle of Decision 1806 applies. The contention of the Chesapeake & Ohio is sustained." *Case 1820, Charleston & West Carolina versus Chesapeake & Ohio.*

Truck Side Frames Not Standard to Car

The Union Pacific applied two new U-type side frames under Atlantic Coast Line car 76663 at Council Bluffs, Ia., on March 23, 1945 because the ones replaced were broken. The A. C. L. removed these side frames on June 29, 1945, after securing joint evidence showing them to be cast with 13⅞-in. column guides and 17⅞-in. deep, the column guides being built up to 12¼-in. with plates on each side welded into place. Claiming the truck sides were neither A. A. R. standard nor standard to the car and were unsafe and unserviceable because of the shims being welded on the inside of the column guides and also because the depth was 17⅞-in. instead of 16 in., the A. C. L. requested a defect card from the U. P. The latter contended that the side frames met the A. A. R. 1938 specifications and that Rule 23 permits the welding of the wear plates on the side frames without heat treatment. The U. P. contended further that the narrow bolster and column guides standard to A. C. L. car 76663 requiring a side frame with bolster opening 12¼ in. wide and lugs 5 in. wide are not A. A. R. standard dimensions.

In a decision rendered November 7, 1946, the Arbitration Committee said, "The evidence indicates that the requirements of Rule 17(0) were not violated. The claim of car owner is not sustained." *Case 1821, Atlantic Coast Line versus Union Pacific.*

Charges for Renewing Inoperative Hand Brake

The Delaware & Hudson applied a geared hand brake to Atlantic Coast Line car 94347 at Binghamton, N. Y., on November 30, 1945, because the hand brake removed was inoperative. Upon advisement that the defective hand brake, after dismantling at the D. & H.'s Oneonta shops, was found to be inoperative because the brake was dry and corroded, the A. C. L. requested that the charges be confined to Item 25-A of Rule 107 to cover cleaning and lubrication and not $19.35, including a credit of $0.50, as billed by the D. & H. The latter contended that it is not mandatory to apply the charge set forth in Item 25-A when work performed is not in conformity therewith. The D. & H. felt justified in renewing rather than repairing the hand brake and believed the circumstances paralleled Arbitration Case 1551 in which the decision was rendered that railroads may use their judgment in repairing or renewing defective parts, particularly at outlying points where repair facilities are limited and prompt dispatching is of primary concern. It called attention to the fact that four man

hours were required to recondition the brake at Oneonta.

In a decision rendered November 7, 1946, the Arbitration Committee said, "The handling of this case by the repairing line was in accordance with the rules. The contention of the Delaware & Hudson is sustained." *Case 22, Atlantic Coast Line versus Delaware & Hudson.*

Condition of Removed Wheel Must Be Reported

The Chicago, Rock Island & Pacific removed a pair of one-wear wrought-steel wheels from Pacific Fruit Express car 60061 on June 26, 1945, allowing scrap credit for one wheel. On their repair card this wheel was shown as "Too low to turn." The Pacific Fruit Express requested the C. R. I. & P. to show on their billing repair card the over-all thickness of tread before turning and the service metal remaining after turning. As the C. R. I. & P. refused to submit these dimensions the P. F. E. contended that there was no record for basing the C. R. I. & P.'s credit for scrap only since the information required in Section (i) (1), Rule 98, was not furnished. The C. R. I. & P. claimed that the provisions shown in this rule refer to one-wear wrought-steel wheels which are turned and obviously not to wheels too low to turn and not turned but scrapped.

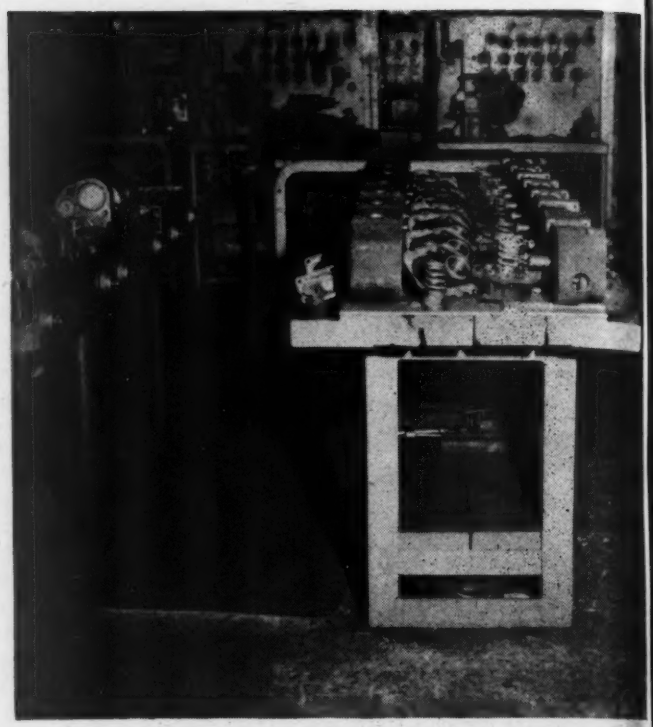
In a decision rendered April 10, 1947, the Arbitration Committee said, "The information required by note following Paragraph (1) of Section (i), Rule 98, was not shown on wheel and axle billing repair card. Therefore, credit on basis of second-hand value, less 1.4 hours for cost of turning both wheels, is proper. The contention of car owner is sustained." *Case 1823, Pacific Fruit Express versus Chicago, Rock Island & Pacific.*

Overhauling Air Brake Valves

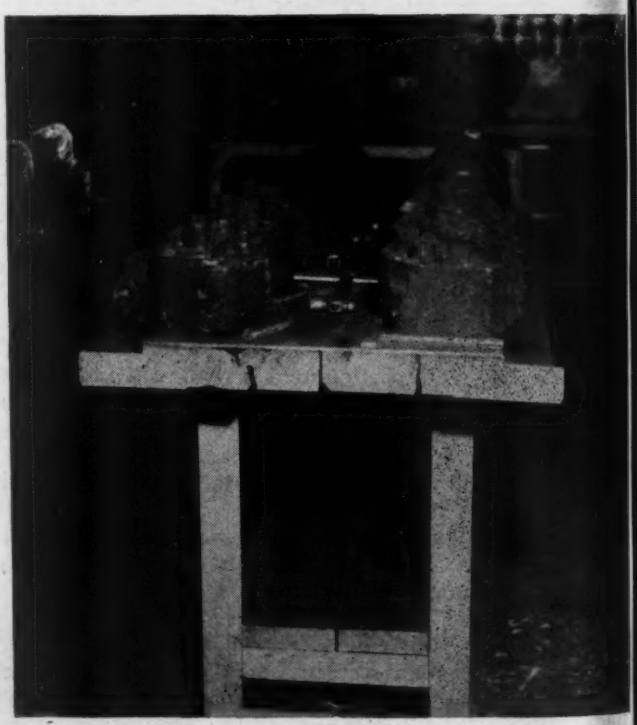
Air brake valves are dismantled and overhauled quickly and efficiently in a compact layout at the Reading, Pa., shops of the Reading. The major features contributing to this fast repair are the methods of using power operated portable tools, the design of the work bench, and the method of transporting dismantled brake valves.

An air-motor-driven impact wrench is used for dismantling a total of 16 portions, or eight service and eight emergency sections. The 16 sections are placed upon the steel table and held in place by ⅜-in. by 1-in. metal strips which outline each section and prevent turning while the wrench is in operation. All nuts or bolts of one size are removed before the socket is changed to remove a different size nut or bolt. The entire dismantling operation for the eight service and eight emergency sections requires an average of about 14 min.

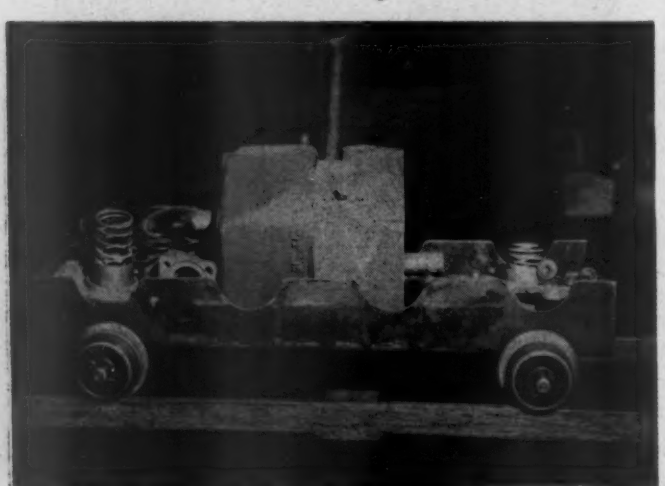
After the brake valves are completely dismantled, they are placed in four-wheel carts which run on two 12-in. gauge rails set about 3 ft. above the floor. The carts are sent around on these rails to one of several assembly men for gauge checking and assembling. The rails are so located as to pass close to anyone connected with work on these valves. The cars are constructed to hold one service and one emergency portion of either P, K, or AB brakes.



The work table is roomy enough to accommodate all parts of the dismantled sections



The work bench showing eight emergency and eight service portions being held in place by the ⅜-in. by 1-in. metal strips



The cart for transmitting the dismantled brake valves from the dismantling table to the repair man

After all necessary work has been completed on the valves they are reassembled and tested on a standard Westinghouse Air Brake Company test rack. Following the test they are loaded into AB shipping containers and returned to the point from which they were sent.

Economical Heat for Railroad Shop Operations

By F. C. Hasse*

New Oxweld oxy-acetylene multiflame heating heads provide an almost instantaneous source of heat for annealing, forming, straightening, and other heating operations in railroad shops. Supplies of oxygen and acetylene are usually available at all points in the shop. The operator needs only to attach a multiflame heating head to a standard welding blowpipe.

These heads are economical to use because the heat can easily be restricted to any desired area. Surface and center temperatures can be held to a required minimum and the operation can be interrupted instantly to check temperatures. Another advantage of this method of heating is that the rate of heating and cooling can be easily controlled.

* Vice-president, Oxweld Railroad Service Company, Chicago.

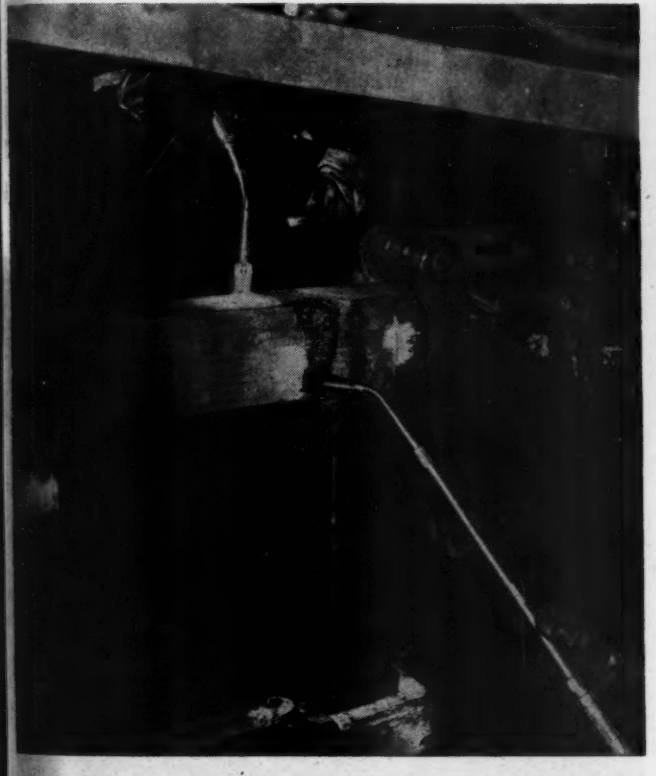


Fig. 1—This 6¼-in. by 6-in. locomotive frame section was heated to a temperature of 1,400 deg. F. in about 18 min. by two multiflame oxy-acetylene heating heads

Fig. 3—Close-up of multiflame heating heads both being applied to one side of the truck frame shown in Fig. 2

The heads have a working face 1⅜ in. in diameter with 24 orifices or flame ports. An extension tube can be added to the blowpipe to help keep the operator away from the heat.

In Fig. 1 a cast-steel locomotive frame that was repaired by electric-arc welding is being stress-relieved. The heat is supplied by a multiflame heating head. At the point where the weld was made and where the stress relieving heat was applied the frame had a cross section of 6¼ in. by 6 in. A section 8 in. long was heated to 1,400 deg. F. in about 18 min. To insure

Fig. 2—The two operators are heating both sides of this bent truck frame prior to straightening with the pull jacks seen on two corners

Fig. 4—Diaphragm plates ½ in. thick are heated for press forming

that the area was brought to the correct temperature, a temperature-indicating pellet melting at 1,400 deg. F. was placed on the area. A temperature-indicating pellet is very simple to use with multiflame heads because the pellets can be placed in position at any time during the heating period. Exposure of the pellets to the direct flames of the heat source can easily be avoided.

A passenger car truck frame is being straightened with multiflame heads in Figs. 2 and 3. After the frame is placed on horses pull jacks are fastened at the corners. Sections about 2 ft. long on both sides of the frame are heated. The mid frame areas were heated to 1,400 deg. F. in about 12 min., and then the turnbuckles were tightened to pull the frame to correct alignment.

The use of the multiflame heads for forming operations is shown in Figs. 4 and 5. Locomotive diaphragm plates ½ in. thick are punched with two 4-in. holes and rolled, and the edges of the siphon holes are then flanged. Fig. 4 shows the area around the hole being heated as the plate rests immediately under the die of a 300-ton press. The flange is easily formed by the press after heat is applied for five min. Before these special heating heads were used, it was necessary to heat the entire plate, form the flange, and then re-form the plate to correct shape. With the localized heat of the multiflame heads, it is easier to maintain the correct radius in the rolled plates. This heating method is also used to heat the larger inside throat sheet locally for the same type of flanging operation.

A test of the heating efficiency of multiflame oxy-acetylene blowpipe as compared to a charcoal furnace was recently made in the shops of one of the railroads. The comparison tests were made by heating a test billet 6 in. by 6 in. by 32 in. A hole 16-in. long and 1 in. in diameter was drilled in the center of the billet and a thermo-couple connected to a standard pyrometer was inserted. The test billet was heated to 1,500 deg. F. surface temperature and 1,400 deg. F. center temperature in 25 min. by two multiflame oxy-acetylene heating heads. Under conditions as nearly identical as possible, a charcoal furnace took 118 min., or almost five times as long to heat the billet to 1,500 deg. F. center temperature. It was not possible to take surface temperatures on the charcoal-heated billet because it was covered with burning charcoal.

The cooling rates of the test billets are also interesting. Because the heating is localized, the cooler metal has a quenching effect. The billet heated by oxy-acetylene multiflame heads colled from 1,600 deg. F. to 400 deg. F. in 105 min. The cooling time for the charcoal-heated billet was 149 min. for the same drop in temperature.

Fig. 5—The diaphragm plate after press forming

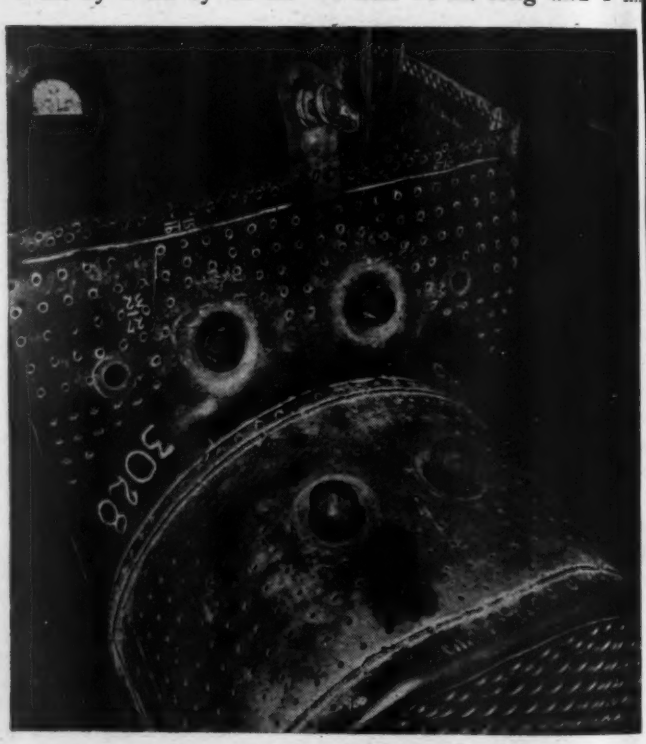


Fig. 6—The diaphragm and inside throat sheets after they were welded into the boiler—The flanged siphon holes were all formed after heating by the multiflame head

ELECTRICAL SECTION

Power for Passenger Cars

By A. J. Manson*

A comparison of the merits of axle generators, prime movers for individual cars and head-end systems for supplying the electrical power requirements of passenger-train cars

ELECTRICAL power requirements in modern railroad passenger cars are growing to such an extent that new methods must be devised to supply these needs. While the axle-generator system has provided great flexibility since early installations when electrically equipped cars were required to operate in trains with other cars not provided with a power supply, the increased capacity necessary for present-day loads is using valuable locomotive drawbar pull. In a fifteen-car train operating on a ruling one-per cent grade, locomotive tractive force sufficient to draw an extra car is being used to provide electric power alone.

Alternating Current Power

Alternating-current power supplied from a separate prime mover at the head end or from individual units in each of the cars results in better schedules, extra cars, or reduced necessary locomotive capacity. A.c. systems also make possible the most efficient use, from an operating and maintenance standpoint, of sealed-in-refrigerant compressor motors used with air conditioning and water coolers; for application of Precipitrons to secure clean air; and for the application of many a.c. auxiliaries to railroad passenger cars that are now used in the home; a.c. devices that have the benefit of intensive research work and mass production.

In discussing a.c. power supply, it seems advisable to cover briefly power supplies in general. These can be segregated into three general systems as follows:

1. Axle-driven generator systems.
2. Individual engine-driven power-plant units, one on each car.
3. Head-end power supply.

Axle-Driven Generator Systems

Axle generators have been used for many years in connection with the supplying of power for railroad passenger cars, at either 32 or 64 volts d.c.

Bearing in mind that the modern railroad passenger car must have all of the latest up-to-date electrical conveniences, thereby requiring a power load greatly in excess of that of only a few years ago, consideration must be given to the generator capacity and the battery voltage to be used.

In the past, 32 volts d.c. has been the standard. Two or three railroads, recognizing the increased railroad requirements that have already been imposed and the further increases to follow, have selected a 64-volt battery. One railroad has standardized on 110 volts.

A point has been reached where the current requirements at 32 volts may average as high as 600 amperes, with peak loads of approximately 1,000 amperes. Under such conditions, the advantages for increased battery voltage above 32 volts far out-weigh the disadvantages of higher battery cost and maintenance.

The advantages to be gained by the higher voltage can be summed up:

(a) Ampere capacity of all electrical apparatus including control and wiring is reduced in proportion to the increase in voltage. Moreover, the efficiency is improved due to a reduction in I^2R losses.

(b) Smaller size of battery-tray units.

(c) Yard charging equipment more efficient because of the lower charging current required.

The total connected load for a modern railroad passenger car which governs the choice of generator size can be determined approximately from the following typical data:

Character of load	Approximate kilowatts
Air conditioning (including evaporator fan) 8 tons at 1.75 kw. per ton	14.00
Miscellaneous auxiliaries: Precipitron (100 watts), Water cooler (200 watts), Fans (400 watts)	.70
Battery charging	9.00
Lighting	3.00
Total	26.70

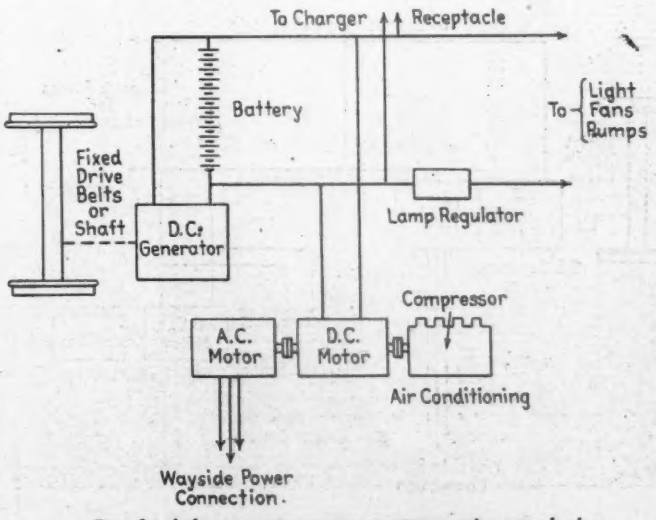


Fig. 1—Axle-generator power system—prior standard

* Assistant to sales manager, Transportation and Generator Division, Westinghouse Electric Corp., East Pittsburgh, Pa.

With such a connected load, the generator should have a normal capacity of 20 to 22 kw. with a liberal overload capacity, and should be designed for approximately 4,000 r.p.m. so as to meet future car speeds that may be in excess of 100 miles per hour.

In the older, axle-driven generator systems, the generator is driven from the car axle through a mechanical or belt drive. The schematic electrical diagram for this system is shown in Fig. 1. Energy is supplied for charging the car storage battery, for operating the air-conditioning compressor motor, and for other auxiliaries including car lights. The lighting circuit is connected through a lamp regulator to obtain suitable voltage regulation at various car speeds. At low car speeds, the voltage of the generator is below that of the battery so that a magnetically operated switch is used to disconnect the generator from the battery until such time as the generator voltage is ample. At such low speeds and at standstill, the battery provides the energy for operating the air-conditioning motors, lights, and other auxiliaries. Obviously, this arrangement means a substantial size of battery as well as careful maintenance to keep the battery in operating condition. The connection to wayside power is obtained by mounting a 220-volt, three-phase, a.c. motor which drives the air-conditioning compressor.

A limited amount of a.c. power for fluorescent lighting, Precipitron, water coolers, and conventional outlets for connecting commercial units may be obtained from a small motor alternator, preferably 4 kw. in capacity, the motor end of which takes its power from the battery. It would be difficult to produce alternating current simply from directly driven axle generators, the speed of which must vary with the wide ranges in speed of a railway passenger car. Since no suitable, constant-speed drive is available and operation of air conditioning, lighting, water coolers, and other auxiliaries must continue while at standstill, a storage battery is required if axle power is used.

An improvement over the original system shown in Fig. 1 is that of Fig. 2. Here the a.c. motor for wayside operation is mounted on the shaft of the axle-driven generator and preferably enclosed in the same frame. Thus, the generator can be operated at full capacity for battery charging limited only by the capacity of the wayside power. In addition to this important advantage, all apparatus can function normally at standstill, and the car need not be in operation for testing or adjusting of the complete system. Obviously, a clutch must be included between the d.c. generator and the axle so that it will be disconnected at standstill and low speeds.

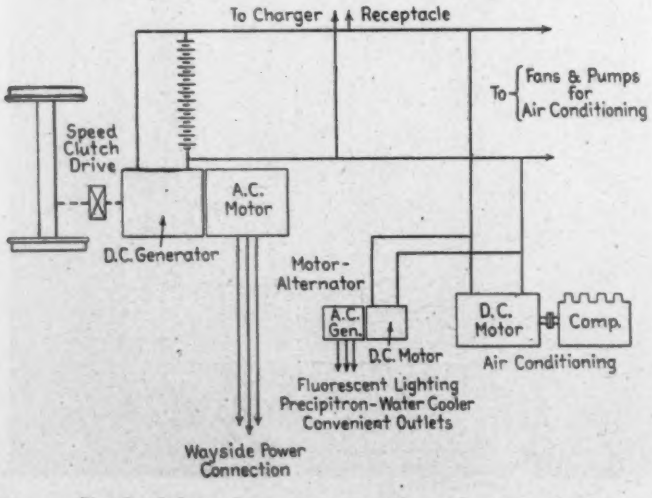


Fig. 2—Axle-generator power system—present standard

Increasing the size of the motor-alternator much above 4 kw. to supply a.c. power for air-conditioning equipment is not economical both from the standpoint of weight and overall efficiency.

Power From Prime Movers

Alternating-current power generated by a separate prime mover and alternator in each car offers many attractions. Aside from the increased locomotive drawbar pull made available and the continuous supply of power whether the car is in motion or stopped, advantage can be taken of all standard, commercial a.c. apparatus by making the complete power distribution at 220 volts.

By carrying the electrical circuit to adjacent cars through jumpers, emergency power can be transferred to one of these other cars at times when they may lose their own power supply. Generally the car circuits can be divided so that half the load in each car is kept alive. This transfer of load from the live to the dead car can be done automatically through very simple switching arrangements. There are advantages from the car layout standpoint if the 8-ton air conditioning apparatus in each car is split into two 4-ton units. One of these smaller units would continue to operate in both the live and the dead cars when one car generator supplies both cars. In addition, at times of light load, only one of the 4-ton air conditioning units need be operated. Such an arrangement has the distinct advantage of lower power demands at starting.

The schematic diagram of such a system is shown in Fig. 3. Every facility is made available: a connection for wayside power; the battery connection to a charging receptacle for short and quick battery boost at stations if necessary; 3-phase 220 and 110 volts available for operation of commercial units; a.c. voltage available for a Precipitron installation, water coolers, and fluorescent lighting; current capacity available for electric auxiliary heating; and battery charging through a Rectox.

To obtain lower first costs and to utilize standard and developed control apparatus, consideration should be given to energize the control circuits from the battery at 32 volts.

A superior arrangement of the control functions is as follows: The first operation would be the starting of the engine-generator set which can be accomplished by means of an engine-starting push button to connect battery power to a small starting motor preferably mounted on the engine-generator shaft extension. When the engine fires and comes up to speed, it should be connected automatically to the load. There should be interlocking between the engine-generator set and wayside power so that when the latter is plugged in, the engine-generator set is shut down if operating; that is, wayside power should take preference.

A most important item in the use of separate prime movers and generators for each car is that all traction drag of the electrical equipment is removed from the cars. The result is lower required train propelling power, or higher train speeds for equal train capacity and weight. If the same speeds are retained, additional equipment can be used without exceeding the total horsepower available.

Assume in the conventional system shown in Fig. 2, that the generator is delivering its normal load of 20 kw., or approximately 27 hp. Then the horsepower required at the axle to drive the generator, taking into account the generator and drive efficiencies is approximately 33 hp. On a 15-car train, this means a requirement of approximately 500 hp.

Moreover, considerable advantage is obtained in actual reduction of the total overall weight of the train with the

use of separate power plants. It can be expected that the weight saving per car will be approximately 3,300 lb. (See Table I). Here then is a direct saving in train weight with a 15-car train of 49,000 lb. The 500 hp. saved

Table I—Data Showing Weight Advantage of Individual Engine-Driven and Head-End Power Units Over Axle-Generator System

	Approximate weight per car, lb.		
	Diesel unit	Axle generator	Head-end
Diesel engine generator set	2,000	...	...
Battery	640	4,240	640
Axle generator drive	...	780	...
Axle generator	...	1,330	...
Rectifier	200	...	200
Transformer	300	...	350
Motor alternator	...	560	...
D.c. compressor motor	...	575	...
Two 5 hp. a.c. compressor motors	300	...	300
Lamp regulator	...	150	...
Control			
Train line and jumpers, cable	540	225	710
Fuel tank and fuel	580	...	...
	4,560	7,860	2,220
Approx. saving in weight per car, lb.	3,300	...	5,660

Note: Weight of air conditioning apparatus, fans, etc., assumed equal in all three systems.

at the power unit due to the elimination of the axle-generator drag (15 cars × 33 hp. each = 495 hp.) makes possible the use of a lighter locomotive resulting in a still further reduction in train weight. (See Table II). The average weight per horsepower for the Diesel locomotive can be taken at 160 lb., so that a locomotive 80,000 lb. lighter can be used and when combined with the 49,500 lb. mentioned above, will give a total train weight saving of 129,500 lb; the steam locomotive at 120 lb. per hp., a total train weight saving of 109,500 lb; and with an electric locomotive weighting approximately 90 lb. per hp., the total saving in train weight would be 94,500 lb.

Maintaining the same motive power unit capacity, the 500 hp. saved can be used for hauling a longer train. This 500 hp. is equivalent to a tractive force of 1,875 lb. at 100 m.p.h. which means the ability to haul on a ruling one-per cent grade an added train weight of 114,000 lb. This figure combined with the above mentioned 49,500 lb., (saving in the 15-car weight) gives a total of 196,500 lb. which means that on the average railroad with a ruling grade of one per cent an additional car fully equipped can be added and the same schedule maintained.

An important feature in connection with such a system utilizing the commercial electrical products is the possible use of the "package," that is, each item can be self-contained, easily removable as a unit for repair or overhaul, and replaced by another unit with minimum delay to the car operation. Such a package arrangement begets a high availability factor for each car. Moreover, repairs to these units can be shop performed at a correspondingly lower maintenance cost. This package arrangement can be carried out to include the engine-generator set mounted on slide rails; the air-conditioning units where each compressor can be piped to its own half of the evaporator and condenser and each having its own receiver. There need be no common piping. Also,

Table II—Saving in Train Weight, Individual Engine-Driven Power Plant Unit

	Diesel loco.	Steam loco.	Electric loco.
Weight saving on 15 cars (15 x 3,300), lb.	49,500	49,500	49,500
Saving on locomotives			
Diesel at 160 lb. weight per hp. x 500, lb.	80,000	...	...
Steam at 120 lb. weight per hp. x 500, lb.	...	60,000	...
Electric at 90 lb. weight per hp. x 500, lb.	...	...	45,000
Total train weight saving, lb.	129,500	109,500	94,500

this package system can and should apply to the Precipitron, the blowers, the control panel, the battery, and the heating unit.

Head-End Power System

All the advantages of separate generating systems located in each of the cars can be obtained by a single installation for the entire train located in the baggage car or on the tender. The prime mover can be a turbine

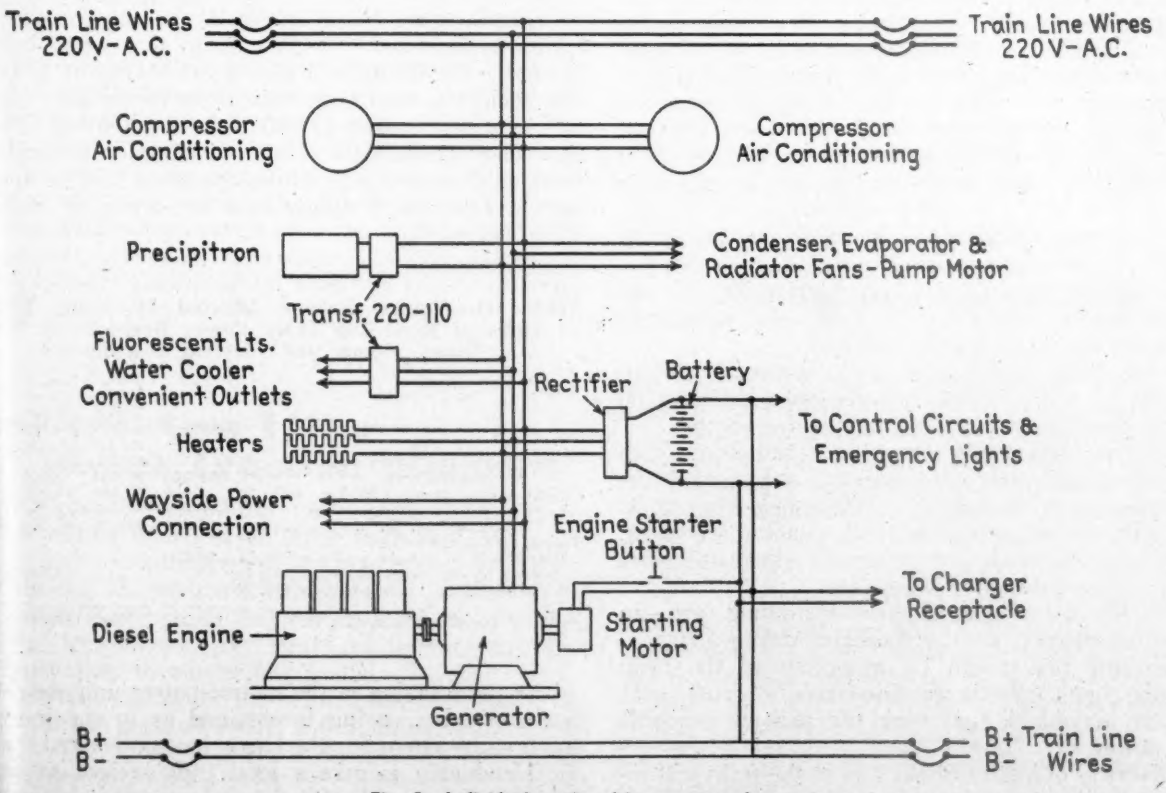


Fig. 3—Individual engine-driven power plant unit

when steam motive power is used, Diesel-electric in conjunction with a Diesel locomotive, or a motor-generator for the electric locomotive. Considerable diversity of loads between cars in the train will result in use of a lower total generator capacity.

During very recent years, there has been a steady growth in the undisturbed, solid-through-train operation from one city to another with turn-around facilities at each terminal and no interchange of equipment between the start and destination points. Under such conditions

Such a system applied to a Diesel-electric propelling unit means that there is a 500 hp. saving due to the elimination of all axle generators as well as a direct weight saving. The total savings will be more than obtained with the individual-car Diesel-electric system as shown in Fig. 3. A transformer of approximately 400 lb. replaces the Diesel-generator set of approximately 2,100 lb. for a saving of 1,700 lb. total since we are assuming that the electrical circuits and apparatus are the same for the two systems. Compared with the axle-generator system

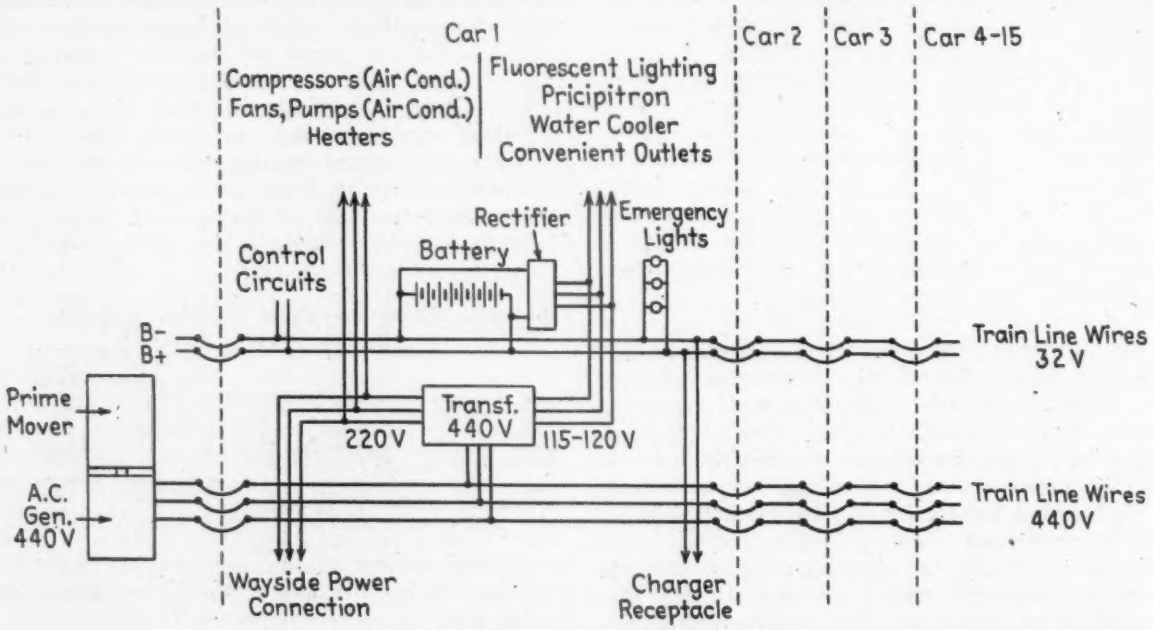


Fig. 4—Head-end power supply

of operation, the head-end power system will prove most practical.

A schematic diagram of a typical layout is shown in Fig. 4. A 440-volt train-line distribution is shown. Choice of this voltage results in economical sizes of wire and rotating equipment. Mounting a three-phase transformer for 110-220-volt distribution on each car, it is possible to use commercial, hermetically sealed air-conditioning compressors and other auxiliaries for the operation of fans, pumps, water coolers, and fluorescent lighting. Each car circuit layout is flexible and can include all of the advantages of the circuits and layout as shown in Fig. 3.

There are many advantages other than the use of the developed commercial apparatus mentioned above.

(a) Generator capacity of approximately 300 kw. operating at constant speed can be easily and adequately regulated for electrical load variations.

(b) With steam operation, it would be possible to operate some of the locomotive accessories such as oil pumps and lighting circuits, by standards a.c. motors.

(c) A very much smaller battery can be used on each car. A 150-ampere-hour is sufficient as compared to the 600-ampere-hour at 64 volts or 1,100-ampere-hour at 32 volts, as used on the conventional axle-generator systems.

(d) Elimination of all axle-generator systems together with their relatively high maintenance.

(e) Possible use of electric power for dining cars—an attractive substitution for the standard arrangement.

(f) Wayside power can be connected to the train through one connection (if wayside capacity is sufficient) or to each individual car using the present available wayside power.

(g) Diversity of load between cars in the train will result in use of a lower total generator capacity.

for a 15-car train and disregarding the weight of the head-end unit, there will be a saving in weight of 85,000 lb. (See Table I).

The weight of a head-end unit of 300-kw. (15 cars at 20 kw. load each) will vary with the type of prime mover. A Diesel-engine-driven generator of this capacity will weigh approximately 18,000 lb. so that when deducted from the 85,000 lb. will give a net saving of 67,000 lb. The weight of a turbo-generator set of the same capacity will be approximately 12,000 lb. for a net saving of 73,000 lb. The approximate weight of a motor generator set used with electric locomotive operation will be approximately 9,000 lb., resulting in a net saving of 76,000 lb. (See Table III).

Table III—Weight Savings Affected by Using Different Kinds of Head-End Train Power Respectively With Diesel, Steam and Electric Locomotives

		Steam loco.		
	Diesel loco.	Turbo-generator set	Diesel generator set	Electric loco.
Weight saving on 15 cars (15 x 5,660), lb.	85,000	85,000	85,000	85,000
Weight prime mover (300-kw. set), lb.	18,000	12,000	18,000	9,000
Net saving, lb.	67,000	73,000	67,000	76,000
Saving on locomotive				
Diesel—160 lb. weight per hp. x 500, lb.	80.000	...	...	...
Steam—120 lb. weight per hp. x 500, lb.	...	...	60,000	...
Electric—90 lb. weight per hp. x 500, lb.	...	...	...	45,000
Total train weight saving, lb.	147,000	73,000	127,000	121,000

The same saving in the motive-power unit weight due to the 500 hp. saving is obtained as in the individual power-unit system, for the Diesel locomotive and the electric locomotive to give a total train weight savings of 147,000 lb. and 121,000 lb. respectively. Maintaining

the same two motive-power units, the 1,875 lb. tractive force saved means a possible added train weight of 114,000 lb. in addition to the apparatus net savings of 67,000 lb. for the Diesel locomotive train and 76,000 lb. for the electric locomotive train, or totals of 181,000 lb. and 190,000 lb., respectively. This means, in general, that on a ruling one per cent grade one car can be added to the 15-car train and a better performance obtained.

When applied to a steam-locomotive-propelled train, the situation is slightly different. The direct saving in weight of 85,000 lb. would be the same minus the turbo-generator of 12,000 lb., or approximately 73,000 lb. net. There is some advantage that can be obtained by saving the 500 hp. drag of the axle generator due to the fact that the required pounds of steam per hour taken from the boiler for a 300 kw. load on the turbo-generator set, is less than the steam consumption to develop the required 500 horsepower capacity and locomotive tender size will not change. The steaming capacity of the boiler is the limiting factor of steam motive power at high horsepower output and high speed. Theoretically, the locomotive weight can be reduced due to the lower drawbar pull requirements with the lighter train, but practically there would be little if any saving in weight. This total saving in weight of 73,000 lb. is not sufficient to allow the adding of another car to the train for a one per cent ruling grade operation, but it does mean that the lower train weight will result in a better schedule performance.

By utilizing a Diesel-generator set mounted in the baggage car for head-end power, advantage can be taken of the saving in the 500 hp. drag of the axle generators so that on a ruling one per cent grade one car can be added.

Advantages of A.C. Power

From the above, it is shown that a.c. power supply for passenger cars offers many advantages, the four most important being:

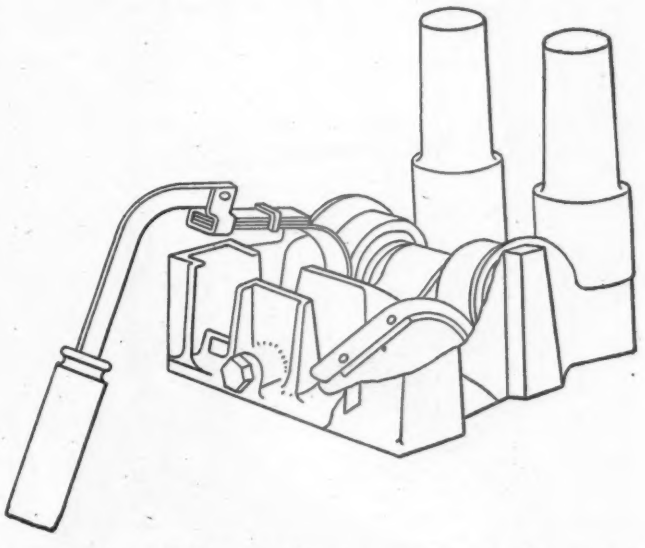
1. The ability to use and apply commercial apparatus already developed, at considerable saving in first and replacement costs.
2. The reduction in weight per car resulting in possible use of an additional car in the train, maintaining the same schedules; or improving schedules with the same number of cars.
3. The use of certain pieces of apparatus (at nominal cost and installation expense) which are desirable and may be essential at an early future date, namely the Precipitron, electric heating, and dining-car electrification.
4. The maintaining in operation of the complete car auxiliary equipment even with a low battery.

Today, alternating current is the standard in practically all stationary distribution systems. Its advantages can also be realized when used for auxiliary power on trains.

Pressure Arm Lifter For Diesel Traction Motors

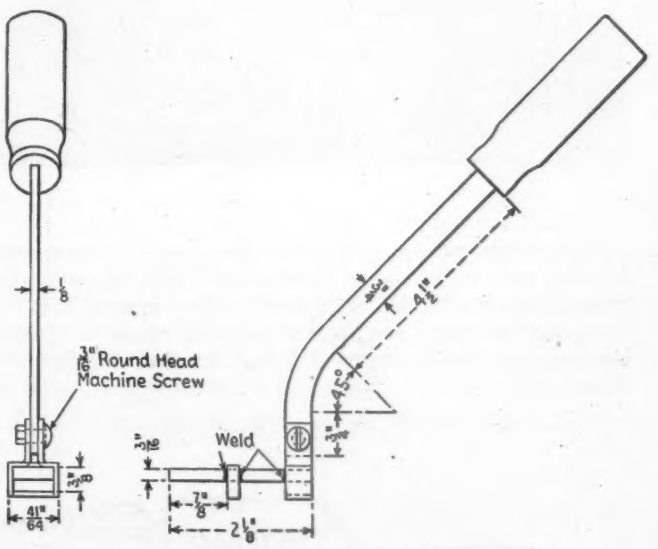
A brush pressure arm lifter for use on Diesel-electric traction motors which saves much time and avoids annoyance and injured fingers is shown in the accompanying illustrations. The particular model shown is designed for the General Electric type 731 motors used on Alco-G.E. 1,000-hp. locomotives. By means of minor changes it may be adapted to almost any motor.

Due to the position of the brushholders on most traction motors, it is an awkward and tedious job to change brushes. The usual procedure consists of holding the pressure arm up with a hook or screwdriver, while the brush is slipped out or replaced. If the hook or screwdriver slips, it usually means a bruised finger or split fingernail. With the tool shown, there is no slipping and



The tool as applied to a brush pressure arm of a traction motor

the pressure arm can be lowered easily without danger of cracking a new brush. Also, the time required to change a brush can be cut in half.



Dimensional drawing of the pressure arm

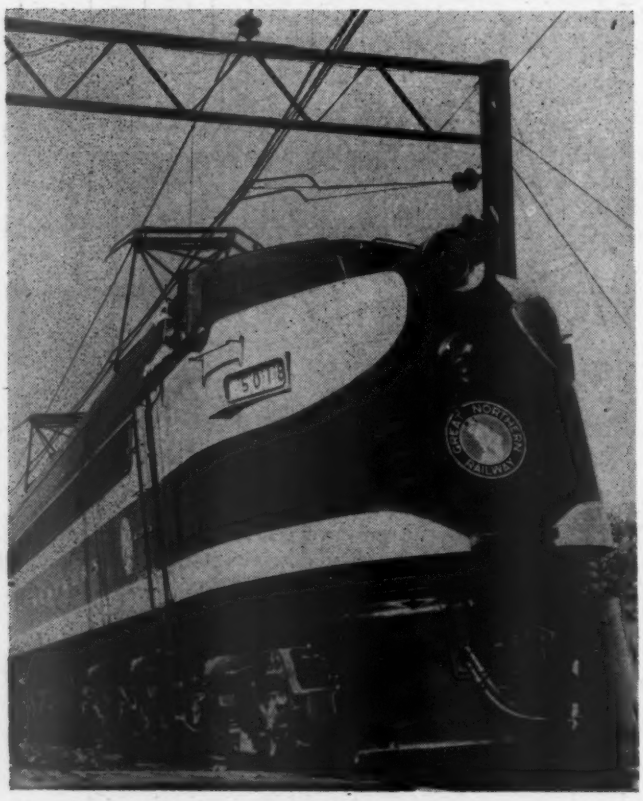
The strap was a back strap from a duplex plug receptacle. The pins are pieces of 5/16-in. welding wire. The handle was an old file, ground down to size, softened and bent to shape.

The tool was designed by Robert Gibson, Little Ferry Shops, New York, Susquehanna & Western, Ridgefield Park, N. J.

HENRY FINDS TRAINS SAFER THAN HIS OWN HOME.—Colonel Robert S. Henry, assistant to president of the Association of American Railroads, fell off a ladder at his home on Independence Day and broke his leg. But such a misfortune is insufficient to silence an enthusiastic salesman of the virtues of railroad transportation. From the hospital he writes: "I'm just a Fourth of July statistic—affording living, if somewhat painful, evidence that people are safer on trains than in their own homes."

Great Northern Single-Cab

5,000-Hp. Electric Locomotives



Two single-cab electric locomotives, each a mammoth 360-ton unit 101 ft. long developing 5,000 hp., built especially for the Great Northern by the General Electric Company, are operating over the line's 73-mile electrified Cascade section between Wenatchee and Skykomish, Wash.

By R. A. Williamson*

* Transportation Divisions, General Electric Company, Erie, Pa.

Two 360-ton locomotives, built by General Electric, have all the weight on drivers—Tractive force of 180,000 lb. available for starting and acceleration

Designed primarily for heavy mountain service, this Class B-D+D-B, 11,000-volt, 25-cycle, single-phase motor-generator locomotive has a continuous rating of 5,000 hp. at the rail, with 119,000 lb. tractive force at a speed as low as 15.75 m.p.h. For starting and acceleration, tractive forces up to 180,000 lb. are available. All weight is on the drivers, every axle is motor-driven, and maximum regenerative braking is provided.

The continuous braking horsepower provided through regenerative braking is approximately 5,750 hp. between 16.5 and 65 m.p.h. This braking power, in conjunction with the great weight on drivers, makes is possible in many cases to handle heavy trains on grades without the use of the train air brakes, with a resultant decrease in wheel and brake-shoe maintenance.

The locomotive is equipped with two five-unit motor-generator sets, one set mounted in each end of the apparatus compartment. Each set is driven by a 25-cycle, 750-r.p.m., single-phase synchronous motor, both motors taking power from the trolley through a single transformer, and delivering d.c. power to the 12 traction motors. In addition to driving the traction generators, each synchronous motor drives a traction-generator exciter

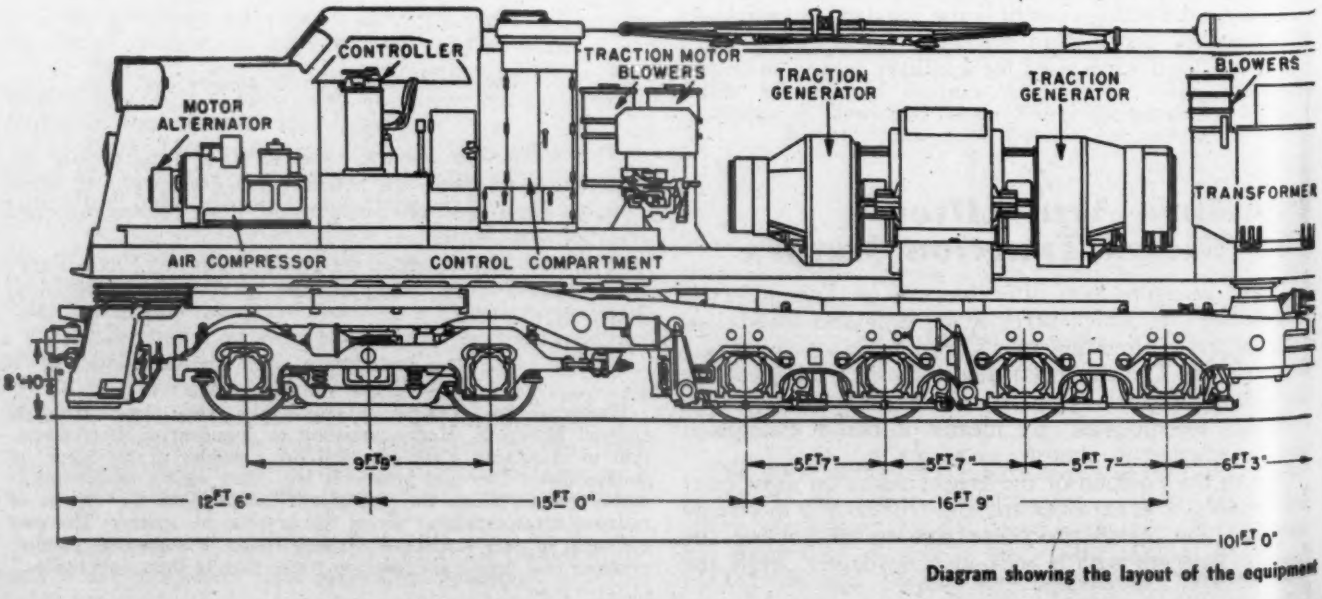


Diagram showing the layout of the equipment

and a regenerative exciter. The motor-generator sets are started by applying reduced d.c. voltage to the generators, using them as starting motors. The regenerative exciters provide traction motor excitation during regeneration and motor field control during motoring. Generators may be connected in parallel for hauling heavy trains at lower speeds or series-parallel for high-speed passenger service.

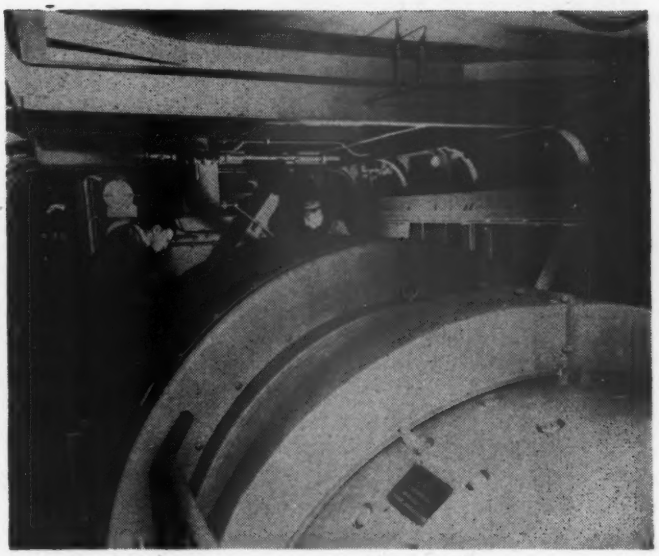
The single transformer, situated in the apparatus compartment between the two motor-generator sets, is an 11,000 to 1,350-volt, Pyranol-filled, air-cooled unit. Power is drawn from the overhead trolley through spring-raised, air-lowered, double-shoe-type pantographs.

Twelve specially designed GE-746 300/600-volt, d. c. series-wound, axle-mounted traction motors power the locomotive, one motor per axle. Each motor is rated at 500-hp. for traction, both hourly and continuous, with FS-1 rating of 1,150 amp. hourly, and 1,050 amp. continuous. Geared 70 to 17 for speeds up to 65-m.p.h., each motor has a single reduction, solid gear with solid pinion. Cooled by forced ventilation, each motor receives 2,300 cu. ft. of air per minute from high-capacity traction-motor blowers located forward of the motor-generators in the apparatus compartment.

Two three-unit motor-alternator sets, placed in the nose compartments of the cab, furnish power for the auxiliaries. Each set includes an 85-hp., 1,475-r.p.m., single-phase induction motor driving a 62.5-kva., 123-cycle alternator and a 15-kw., 75-volt d.c. generator. The d.c. generator supplies control power, starts the synchronous motors by motoring the traction generators and charges the battery while the 123-cycle alternator powers the traction-motor blowers.

Also located in the nose compartments, two two-stage, a.c. motor-driven air compressors have a displacement of 150 cu. ft. per min. and maintain a reservoir pressure of 130 lb. per sq. in.

The control stand, conveniently located at the left of the engineman's position in the cabs, mounts the master controller, selector and reverser handles ,and regenerative braking controller. The instrument panel, forward of the engineer, incorporates two duplex air gauges, and synchronous-motor a.c. amperes, synchronous-motor volts, balancing volt-meter, traction-motor armature amperes and traction-motor field ampere gauges. Pneumatic speed recorder with indicator is also provided at each operating position.



Interior of the apparatus compartment showing the motor-generator set and transformer

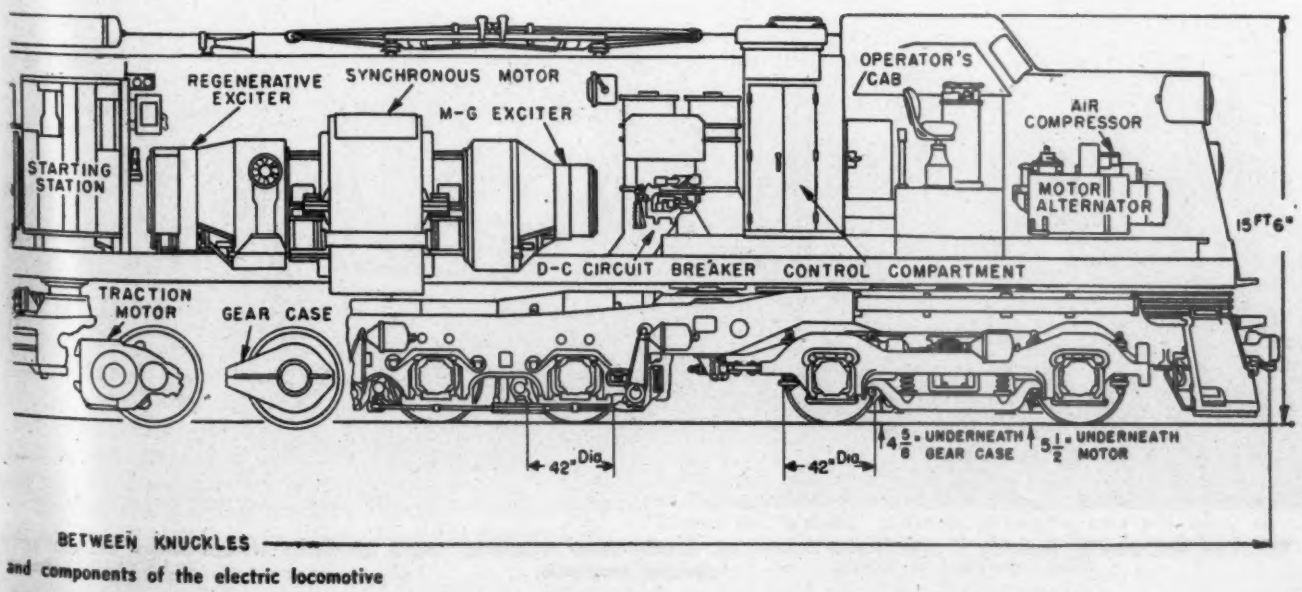
Main control equipment, housed in compartments directly behind the operator's cabs, consists of a type PCL, double-end control which permits operation of the locomotive in multiple with similar units. Traction motors, two groups of six motors in parallel connected in series, are connected to traction generators through JR, high-speed circuit breakers. These high-speed breakers are tripped if a ground or over-load on the main traction generator occurs.

A motor-element pantograph relay and ground switch system provide primary-circuit protection, including the high-voltage windings of the main power transformer and the low-voltage a.c. circuits. Thermal-overload relays and thermal-trip breakers protect auxiliary circuits with temperature detectors in the synchronous motor windings and the transformer Pyranol.

Overspeed protection equipment functions at speeds in excess of 65 m.p.h., and wheel slip relays and ground protection is also provided.

The modern, streamlined, double-end superstructure is of all-welded construction, fabricated throughout from steel shapes and plates. Operators' cabs, designed as an integral part of the locomotive structure, give maxi-

(Continued on page 435)



and components of the electric locomotive

Diesel Power Plant for

Passenger Car Power Supply

All auxiliary power on "Train of Tomorrow" is supplied by individual Diesel power plants having separate generators to carry lighting and motor loads

EACH car in the General Motors Train of Tomorrow is equipped with an individual power plant which supplies power for air conditioning, lighting, and all other electrical requirements of the car. Heat is furnished by an oil-fired boiler on the Diesel locomotive. All tractive power developed by the locomotive is available for hauling the train. The car power plants each consist of a three-cylinder, 45-hp., 1,200 r.p.m., type 3-71 Detroit Diesel engine connected directly to two alternating current generators, built on a common shaft and within a common frame. One of the generators is a 15-kw., 220-volt, 60-cycle, 3-phase, a.c. machine for operating air conditioning and refrigerating equipment. The other is a 10-kw., 120-volt, 60-cycle, a.c. machine which furnishes current for lighting, ventilation, radio sets, electric shavers and other small devices.

Mounted on the side of the alternator housing, and driven from the extended alternator shaft, is a 3-kw., 38-volt, 1,800 r.p.m., d.c. generator which excites the fields of the two a.c. generators and charges the 186-amp.-hr., 16-cell lead-acid storage battery required for engine cranking, controls, and emergency lights.

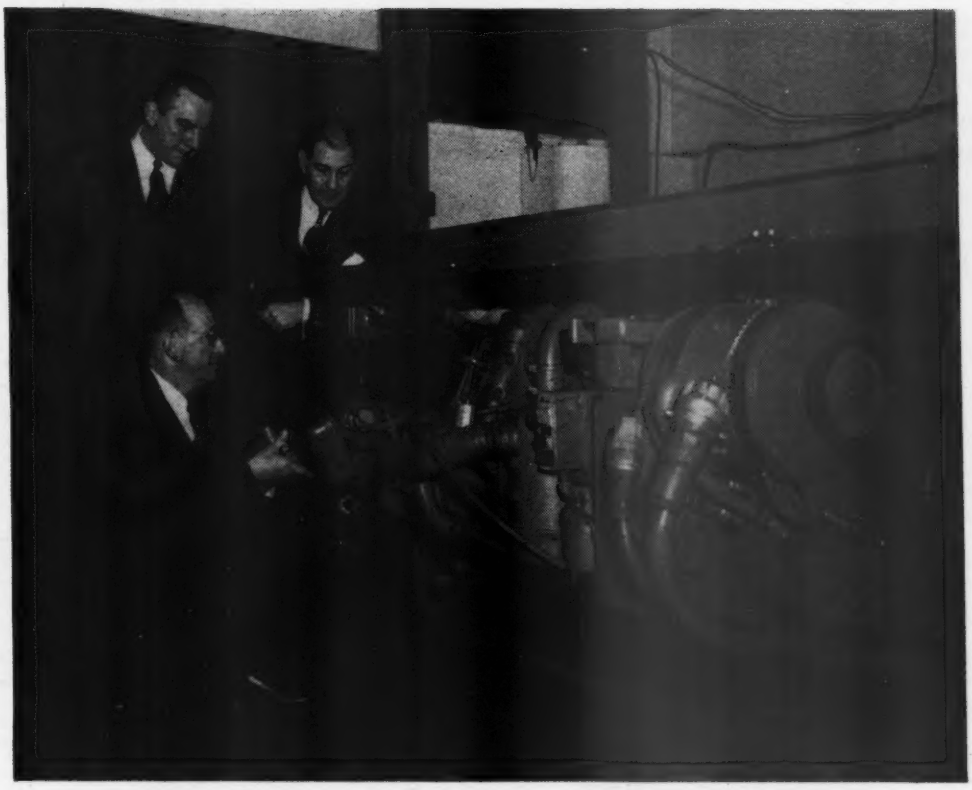
Since the two generators are electrically separated and the armatures and engine crank shaft have considerable inertia, there is no fluctuation of the lights on the 120-volt circuits when a motor is started from the 220-volt, 3-phase machine. The connected load on the 10-kw. generator is about 5 kw. This allows for supplying the blowers and lights in an adjacent car through train connectors.

The entire power plant is supported by synthetic rubber mountings and is enclosed in an air-conditioned, dustproof compartment located below the floor of the car. The engine is tilted on its crankshaft axis to meet necessary rail clearances, and to make operating parts accessible for inspection, adjustment or replacement. Electrical, fuel, and coolant line fittings can be easily disconnected. Roller bearings built into the mountings permit the entire unit to be pulled out from the side of the car for repair. When the unit is in place, two screw operated wedges serve to lift the weight of the unit off the roller bearings and lock it in position. A unit requiring shop repair can be removed and a replacement unit installed in less than an hour.

The engine cooling system is tightly sealed and requires no servicing. A radiator is located outside the compartment and is cooled by an electric fan. The engine may be started or stopped manually by a switch under the car or from the electric locker within. Once started, operation is automatic. If the engine stops, emergency lights switch on automatically.

The output of both a.c. generators is controlled by a simple d.c. carbon-pile regulator. Direct current output is governed by similar means and the circuit is provided with a reverse current relay to prevent the battery from discharging into the generator when the output voltage is below that of the battery. Only standard devices regularly used by railroads are included among the con-

The power unit showing, from left to right, engine radiator, a.c. standby power receptacles, engine, generators, storage battery, and d.c. battery charging receptacle



Unit in the pulled-out position—B. J. Vandoren, assistant manager of direct factory sales, (kneeling), P. H. Brennan, sales manager of direct factory sales, (left rear), and L. McCutcheon, manager of direct factory sales, (right rear), all of Frigidaire Division of General Motors, look at the Diesel engine

rol equipment. Complicated controls, often associated with a.c. equipment, have been eliminated. The Diesel engine is controlled by a magnetic throttle and by a governor which maintains a speed of 1,200 r.p.m.

The dining car, featuring an all-electric kitchen, is equipped with an auxiliary power unit consisting of a four cylinder type 4-71 Detroit Diesel engine driving a 0-kw., 220-volt, 3-phase generator. It is operated only when additional current is required for the kitchen appliances.

Advantages afforded by the power unit are a load reduction for the locomotives, a reduction of the size of battery required, and the availability of full use of all devices while car is stationary or uncoupled from train.

Main truck axles are side-equalized by semi-elliptic springs connected to equalizing beams and to the truck frames while helical springs provide additional cushioning. Additional controlled lateral motion is provided on the two inner axles of the main trucks. Spring-loaded restraining devices increase stability on tangent track.

The entire locomotive superstructure is supported on the main truck frames by two center plates, one being the sliding type; and spring loading pads. The loading pads, positioned near the inner end of the main trucks, bear upward against the underside of the superstructure. Both loading pads and centerplates have replacable wearing plates.

* * *

Great Northern Single-Cab 5,000-Hp. Electric Locomotives

(*Continued from page 433*)

mum operating visibility and comfort. Doors and windows are fitted with safety glass, and cab walls and roofs are insulated with a fire-resistant material. Doors on both sides of the operating cabs give access to the apparatus compartment.

Extending between the operating cabs, the apparatus compartment contains the motor-generators, transformer, starting station, traction-motor blowers, and auxiliary equipment. Removable roof hatches allow ready access for service and removal of equipment. The nose compartments, containing the motor-alternator sets and compressors, are designed to permit removal of equipment and passage to a following locomotive or car.

The locomotive has two four-axle motorized main trucks and two two-axle motorized guiding trucks. The main truck frames, carried on the guiding trucks, extend over beyond the guiding trucks to support rubber-type draft gear consisting of swivel-butt, Type E couplers with alloy-steel knuckles.

Diesel-electric locomotive cabs in production—Scene in the plant of the Heintz Manufacturing Company, Cleveland, Ohio, taken from "Electric Arc Welding," a motion picture in color and sound produced for the General Electric Company by the Raphael G. Wolff Studios in Hollywood, Calif.

NEW DEVICES

Rotary Cam Poppet Valves

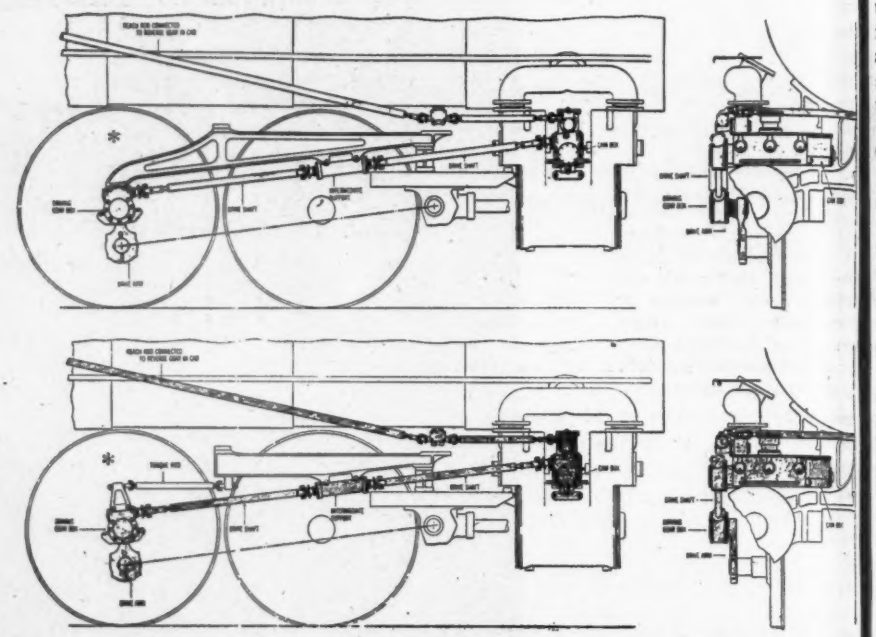
A continuous-contour rotary cam which eliminates cams with a series of different profiles arranged in steps along the axis of the cam, and which can be operated by the same power reverse gear as used on the Type A oscillating cam drive is manufactured by The Franklin Railway Supply Company, 60 East Forty-second street, New York. The Franklin System of Steam Distribution employing this new type rotary cam has been designated as type B. It may be had in either of two styles: type B with one intake and two exhaust valves or type B-1 with one intake and one exhaust valve. The valves and related parts, many of the cam-box details, and the reverse gear are the same as used on the type A System.

The poppet valves are double-seated, small, and light in weight. They are arranged horizontally on a single level and each is opened by action of a tappet against one end of the valve stem and closed by the action of a spring and steam pressure against the other end. The outer valve seat is pressed into the outer steam-port wall. The valve-stem guide, which carries the inner valve seat, is pressed into the inner steam-port wall.

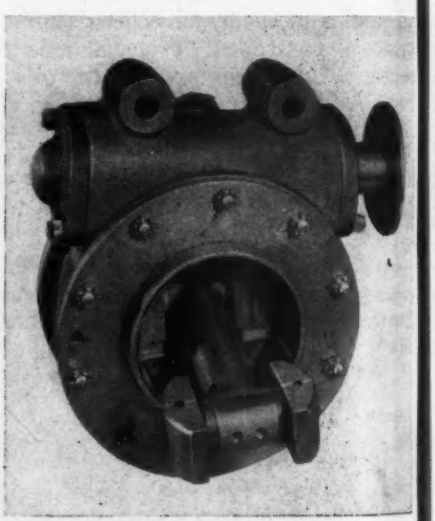
The continuous-contour rotary cam—The end cams are for exhaust valves; the center cams, for intake valves

While the cylinder barrel, saddle and frame mounting are of conventional design, special steam chests are required. These are integral with the cylinders and are located over each end of the barrel. They contain the multiple openings for the poppet valves, and between the steam chests space is provided for mounting the cam box on the cylinder.

The drive for the type B system is taken as rotary motion from drive arms (return cranks) mounted on the right and left main crank pins. The ends of the drive arms are located on the same centerline as the driving axle. Two types of driving gear boxes are available to meet clearance and space limitations. One type is supported on the frame; the other is carried by the drive arm.



Upper: The Franklin type B System of Steam Distribution with the frame-supported driving gear box — Lower: The type B with the drive-arm-supported driving gear box

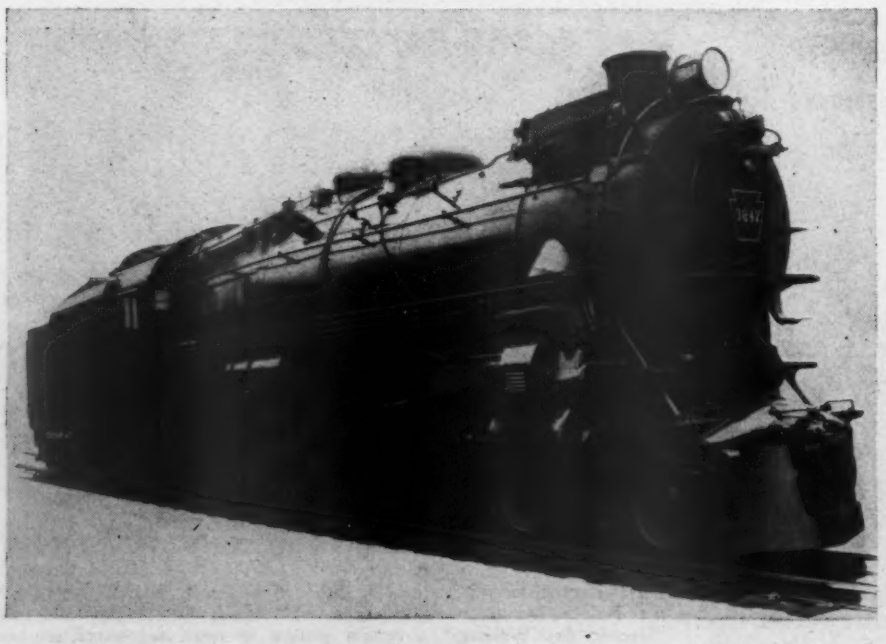


The frame-supported-type driving gear box

With the frame-supported type, the driving-gear box contains a worm gear, the wheel of which is driven by a drive link. The drive link provides compensation for rise and fall of the driving box and lateral movement between driving axle and engine frame. The worm gear converts the rotation taken from the driving wheel into rotary motion at right angles to it.

With the drive-arm-supported type of driving gear box, the worm wheel is keyed to the pin of the drive arm and flexibility is provided in the drive shafts. A torque rod is used to prevent rotation of the driving gear box.

A supported drive shaft, incorporating the necessary universal joints, transmits the motion from the driving gear box to a similar gear arrangement on the cam box. Here an identical worm gear drives



The Franklin type B System of Steam Distribution with a frame-supported driving gear box applied to a passenger locomotive

the cam shaft, which is parallel to the axle, exactly in synchronism with the axle.

The cam boxes are located on the cylinders between the steam chests. In the type B system, all cams for one cylinder—for forward and backward motion, intake and exhaust—are mounted on the one cam shaft which rotates in synchronism with the main driving axle. Intermediate levers with cam rollers, one for each valve, follow the cams, actuating the valve tappets.

The power reverse gear, for reversing and changing cut-off, is located entirely within the cab. The hand lever and notched reverse-lever quadrant are of the type usually supplied with power reverse gears. The reverse gear is connected to the valve gear by a rotating reach rod driven by a reversible air motor.

In the type B system, the reach rod connects the reverse gear to both cam boxes and produces a lengthwise movement of the cam shafts as the hand lever in the cab is moved. Since the opening and closing profiles of both intake and exhaust cams are continuously changing over the entire length of the cams, the timing of the valves changes according to the movement and setting of the reverse gear.

With the continuous-contour cam, the number of cut-off positions for forward motion is limited only by the number of the notches on the reverse gear quadrant. In backward motion only one cam is provided, giving a cut-off suitable for continuous running. For prompt backward starting, provision is made for feeding steam through a long cut-off, effective up to only a few miles per hour.

A manually operated reverse gear can be provided where a power gear is not required or where compressed air is not available. Free running, with the throttle closed, is effected by means of a drifting device on the cam box controlled from the cab. When set for drifting, either all intake valves or all exhaust valves, depending upon design, are held fully open, providing a full-size by-pass from one end of the cylinder to the other.

The Franklin System of Steam Distribution, either type A or type B depending on conditions, may be applied to new or existing freight or passenger locomotives. All mechanism is located so as to be fully accessible from outside.

Aluminum Solder

An aluminum solder, called Alsoco, which was developed in Switzerland, is being manufactured and distributed in the United States by the Alsoco Corporation, 10 East Fifty-second street, New York.

An investigation, conducted by the New York Testing Laboratories, showed that when Alsoco was used to solder aluminum to aluminum without flux, and the joint subsequently subjected to a 250-hour salt spray corrosion test, shearing strength of three different types of the solder decreased 3, 8.6 and 4.6 per cent, respectively.

When an aluminum wire was soldered to a standard copper lug, resistance was 20 microhms. After a 250-hour salt spray test, the increase in resistance was 8 microhms. These values are averages obtained by a number of tests.

An aluminum cable joined to a copper terminal lug with aluminum solder

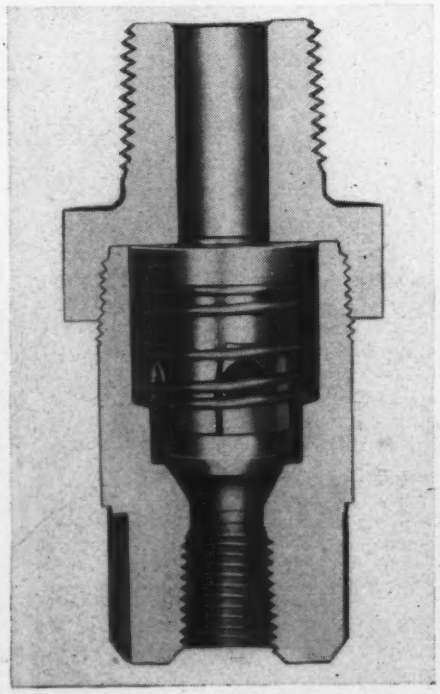
Vibration tests were conducted on ¼-in. and ⅜-in. stranded aluminum cable soldered to standard copper lugs. The ¼-in. cable broke after 44,000 cycles over a .040 in. amplitude at a frequency of 2,450 cycles per second, and the ⅜-in. cable broke under similar conditions after 1,487,000 cycles. The solder itself did not fail. The flow points of all three grades of the solder are well below that of aluminum and its commercial alloys.

Automatic Drain Valves

George automatic drain valves are designed for high-pressure superheated steam, hot and cold water. They are available from the George Manufacturing Company, 10 Harvey street, Philadelphia 44, Pa., in three types: brass for 200 lb. pressure and temperatures of 400 deg. F., stainless-steel for 400 lb. pressure and temperatures of 600 deg. F., and KR monel, heat treated, for 600 lb. pressure and temperatures of 800 deg. F.

A guided cone-shaped disc is supported by a spring that holds it in the open position when there is no pressure on the valve. Steam, air or water pressure entering through the upper connection is exerted on the top of the disc, and upon reaching a pre-determined value, forces the disc down on the seat closing the valve. When the pressure drops below the closing pressure the valve automatically opens and drains off the accumulation.

The upper connection serves the dual purpose of draining the pipe line or device, and supplying the closing pressure. The lower connection or port is the discharge.



The George automatic drain valve

Portable Induction Heater

A portable induction heater manufactured in units of 10 kva. for preheating and normalizing for welding has been announced by Electric Arc, Inc., Jelliff avenue, Newark 8, N. J.

The new Model UP induction heater was developed primarily for its flexibility and adaptability to a wide range of applications

Three 10 kva. units connected for supplying 30 kva.

and capacities, thus eliminating the necessity of stocking a number of heaters in several capacities to handle large and small work. A minimum amount of equipment is necessary. The individual units of 10 kva. each may be stacked on the job to form groups of two and three units with capacities of 20 and 30 kva., to obtain sufficient heater capacity for preheating and normalizing welded joints on pipes of larger diameters. The 30 kva. group, for instance, is capable of preheating a 10-in. pipe joint to 1,300 deg. F. in two hours.

Being compact, the heater is useful in crowded conditions and can be kept close to the work. An adaptation of the Smith-Dolan System, each unit is complete in itself, containing power unit, contactor, meters and control supply. Heating current and voltage output variations are brought about by a selector switch built into the unit and readily accessible. Controlling pyrometers and program controllers can be plugged into the heater in two polarized receptacles for recording job temperatures

and heat cycles. Polarized receptacles are also provided for the interconnection of the heater into groups and for the power supply to the units.

The heaters can also be used for thawing large water lines, testing high current power bus connections, testing current transformers, resistance heating for brazing and soldering, shrink-fitting, heating for straightening, drying water soaked rotors and stators, etc.

Ultrasonic Materials Tester

An ultrasonic materials tester designed to indicate the presence of voids, cracks, porosity, laminations, poor bonds, and other internal flaws in metals, plastics, and ceramics has been introduced by the Special Products Division, of the General Electric Company. The tester is useful in production testing of metal castings, forgings, or finished machined parts, as well as plastic or ceramic parts.

The new tester sends a beam of ultrasonic waves through the specimen being tested. Changes in the amount of energy transmitted through the specimen are an indication of the presence and extent of flaws. The tester is portable and self-contained, easy to use, and provides a direct reading. Testing is not affected by small changes in dimensions or position of test pieces.

The instrument consist of a complete wide-band ultrasonic transmitting-receiving system having a high-frequency generator, a crystal transducer for producing ultrasonic vibrations, a satisfactory medium such as water to transmit these vibrations, a second crystal transducer to convert the received mechanical energy into electrical signals, and an indicator supplying information for materials inspection or analysis.

To examine regularly-shaped specimens, the two transducers are immersed in a tank containing water, and the specimen is inserted between them. Ultrasonic waves are then sent through the specimen, and the resulting reading on the indicating instrument is compared with that for a specimen shown to be sound by X-ray, mechanical breakage, or sectioning methods. Internal flaws will produce measurable decreases in total transmission of waves through the specimen, and a consequent drop in the instrument reading.

The instrument can also be used to indicate changes of viscosity, compressibility, and density of liquids, when these significantly alter the velocity or attenuation of ultrasonic transmission.

The operator is demonstrating how testing may be done in a tank

Arc Torch

An arc torch has been developed by C. E. Phillips & Co., 2750 Poplar street, Detroit 8, Mich., for welding and brazing operations in which a soft flame is the most suitable source of heating. The torch is said to be suitable for such jobs as brazing thin sheet metal, non-ferrous metal welding, and preheating. It can be used with all types of arc welding machines, a.c. or d.c. and is furnished with both bayonet-type and lug-type terminal connectors. Carbon electrodes from ¼-in. to ⅜-in. diameter are accommodated without changing holders or using adaptors.

The current conducting members of the torch are two concentric metal tubes. One slides within the other, and each is connected to one of the carbon electrodes. A control button located in the fiber handle is used to maintain the arc gap at a constant length as the carbons are consumed. The electrode holders extend far enough from the head so that when the carbons are nearly consumed the arc still remains at least 4 in. from the head to prevent overheating the head. The rate of heating the work is controlled by moving the arc closer or by drawing it away slightly.

The Phillips arc torch

Unit Latch For Hopper Doors

The Enterprise Railway Equipment Company, 57 East Van Buren street, Chicago 5, has introduced an improved bar lifting arrangement on their Unit latch for hopper doors. The shelf on the door brace has been designed to form a better fulcrum point for the operator's bar when lifting the latch bar out of engagement to open the door. With this arrangement the opening or shutting of unit doors is said to take only a few seconds.

The Enterprise latch bar in released position

The Unit latch was developed to enable coal consignees to open one door at a time. It locks across the face of the door to eliminate dumping the load through buffing or in transit.

Tong Type Electrode Holder

The A-316 Twecotong is the latest addition to the line of insulated tong-type electrode holders produced by the Tweco products Company, Wichita 1, Kansas. It will hold electrodes from 1/16-in. through 3/16-in. diameter and has a current capacity of 250 amperes.

The A-316 Twecotong holder for 1/16-in. to 3/16-in. electrodes

The A-316 has a weight of 18 oz., a length of 9 in., and a palm span of 2¾ in. The bite on a 5/16-in. electrode is 95 lb. The tip and body insulation is molded laminated glass cloth Bakelite using the patented "Tubular-Keyed" Tweco design. The insulated spring is Neoprene covered. The cable connection is by means of a clamp with a socket for soldering when desired.

NEWS

Iceless Reefer Tested

TESTS conducted by the United States Department of Agriculture in cooperation with various industry groups "indicate that an iceless refrigerator car can maintain temperatures of approximately 0 deg. F. under conditions of summer heat," according to a recent statement issued by the department.

The car in which the tests were conducted has 3-in. insulation and is equipped with a split-absorption system of refrigeration. Tanks attached to the underframe of the car hold the refrigerant, anhydrous ammonia, under pressure. Cooling is achieved as the ammonia moves from the tanks through a single regulating valve and expands in the cooling coils located in the ceiling of the car. When the ammonia has completed its refrigerating effect, it is finally taken up by water in absorber tanks also attached to the underframe of the car. There are no moving parts.

The ammonia consumption rate during the test period—February 11-21, 1947—averaged 42 lb. per hour. During the tests a single charge of anhydrous ammonia lasted 46 hours.

The tests, conducted in a car-testing laboratory at Potomac yards, Alexandria, Va., were made with a car loaded with cartons of frozen tangerine segments. The car was placed in the test house on February 11, 1947. The air temperature inside the house was brought quickly to about 92 deg. and maintained at that temperature for the entire 10-day test.

During the 10-day test the temperature of the frozen tangerines at the top of the load averaged from 4 deg. below zero to 1 deg. above zero. At the bottom of the load, temperatures ranged from 3 deg. below zero to 3 deg. above zero.

Coordinated Associations Meet at Chicago in September

THREE of the Coordinated Mechanical Associations—the Railway Fuel and Traveling Engineers' Associations, the Car Department Officers' Association, and the Master Boiler Makers' Association—will hold sessions at the Hotel Sherman, Chicago, September 15, 16, 17, and 18. The Locomotive Maintenance Officers' Association, the fourth of the Coordinated group, will hold a three-day meeting, completing its program Wednesday, September 17. A joint session will be held in the Grand Ball Room of the hotel on Monday, September 15, at 1:30 p.m. The remainder of that day will be open for the inspection of the exhibits of the Allied Railway Supply Association. The four associations will again meet in joint session in the Grand Ball Room at 2 p.m. on Wednesday, September 17, when the following papers will be presented:

Report of L.M.O.A. Committee on Safety, W. E. Roberts (chairman), superintendent of safety, C. & N. W. Topic: The Supervisor's Responsibility for Safety.

Report of L.M.O.A. Committee on Personnel Training, H. J. Schulthess (chairman), chief of personnel, D. & R. G. W. Topic: Training Understudies and Promoting Supervisors.

Training of Engineers and Firemen for the Diesel Locomotive, by W. D. Quarles, assistant chief motive power, A.C.L. (R. F. & T. E. A.)

Front Ends, Grates, Ashpans, and Arches, by S. A. Tilbury, fuel supervisor, A. T. & S. F. (R. F. & T. E. A.)

Valve Motion, by W. C. Wardwell, master mechanic, N. Y. C. (R. F. & T. E. A.)

The programs for the other sessions are as follows:

Locomotive Maintenance Officers' Association

TUESDAY, SEPTEMBER 16

9 a.m.

Report of Committee on Diesel Maintenance, T. T. Blickle (chairman), master mechanic, Western Division, A. T. & S. F. Topic: The Maintenance of Diesel-Electric Locomotives and Factors Related to It.

Report of Committee on Air Brakes, R. J. Dewsbury (chairman), assistant general air-brake inspector, C. & O. Topic: Relation Between Proper Protection of Locomotive Air Brake Devices and Their Maintenance.

Report of Committee on Forging and Heat Treating, W. H. Ohnesorge (chairman), superintendent of shops, B. & M. Topic: Forging of Locomotive Running Gear Parts.

Report of Committee on Welding, A. W. Johnson (chairman), supervisor of welding, E. J. & E. Topic: Improper Preparation and Welding Practice.

WEDNESDAY, SEPTEMBER 17

9 a.m.

Report of Committee on Shop Tools, H. H. Magill (chairman), superintendent locomotive and car shops, C. & N. W. Topic: Modern Machine Tools and Methods.

Report of Committee on Improved Steam Locomotive Maintenance Practices, by T. J. Lyon, (chairman), assistant to general superintendent motive power, N. Y. C. Topic: Shop Modernization for Handling Present and Future Motive Power.

2 p.m.—Joint Session

Railway Fuel and Traveling Engineers' Association

TUESDAY, SEPTEMBER 16

9 a.m.

Address by President W. C. Shove
Report of secretary-treasurer
Address by: W. A. Collison, vice-president, American Locomotive Company. Subject: The Diesel Locomotive
Address by P. H. Hatch, general mechanical superintendent, N. Y. N. H. & H. Subject: Diesel Operation

2 p.m.

Air Brakes, W. R. Sugg (chairman), Mo. Pac.
A—Handling heavy passenger trains of 12 or more cars
B—Handling heavy freight trains of 72 or more cars
C—Explanation and description of No. 24 R.L. brake, by C. D. Stewart, vice-president, Westinghouse Air Brake Company

WEDNESDAY, SEPTEMBER 17

9 a.m.

The Economical Fuel Unit, by A. A. Raymond, superintendent fuel and locomotive performance, N. Y. C.
Modern Coaling Plants, by Glenn Warner, fuel supervisor, Pere Marquette
Address: The Bituminous Coal Situation, by R. L. Ireland, Jr., president, Hanna Coal Company
Election of officers

2 p.m.—Joint Session

THURSDAY, SEPTEMBER 18

9 a.m.

Coal preparation, by M. B. Adamson, C. R. I. & P.
Lubrication, by E. E. Chapman, mechanical assistant (research and engineering), A. T. & S. F.
Smoke abatement, by G. B. Curtiss, R. F. & P.

Master Boiler Makers' Association

TUESDAY, SEPTEMBER 16

9:30 a.m.

President's address
Address by a railroad mechanical officer
Topic No. 1: Study of I. C. Rules and Regulations, Carl A. Harper (chairman), general boiler inspector, C. C. C. & St. L.
Good of the Association

2 p.m.

Special paper on New Design of Steam Locomotive Firebox, by H. L. Miller, Railroad Sales Division, Republic Steel Corporation
Topic No. 2: Fusion Welding and Cutting as Used with Design, Fabrication, and Maintenance of Steam Locomotive Boilers and Tenders, Edward H. Heidel (chairman), general boiler foreman, C. M. St. P. & P.
Report of secretary-treasurer
Report of Committee on Law
Report of the Executive Board
Good of the Association

WEDNESDAY, SEPTEMBER 17

9:30 a.m.

Address by a railroad mechanical officer
Topic No. 3: Recommended Practices for Staybolt Application and Maintenance, Dr. G. R. Greenslade (chairman), physicist, Flannery Bolt Company
1—Tolerances for taps and staybolts
2—Tools used with threading application and maintenance of steel and other materials, with various types of staybolts
Election of officers

2 p.m.—Joint Session

THURSDAY, SEPTEMBER 18

9:30 a.m.

Good of the Association
Topic No. 5: What Can Be Recommended to Overcome the Cracking of Boiler-Shell Sheets, at the rivet seams and other places which develop in our present-day steam locomotive boilers, R. McBrian, engineer standards and research, D. & R. G. W.
Paper on Causes for Cinder Cutting

2 p.m.

Topic No. 4: Application and Maintenance of Flues, Tubes, and Arch Tubes, E. H. Gilley (chairman), general boiler foreman, Grand Trunk
1—Tools and methods used with the renewing of flues, tubes, and arch tubes
2—Tools and methods used with the safe-ending of flues and tubes
3—Tools and methods used with the application and maintenance of flues, tubes, and arch tubes
Report of Committee on Resolutions
Report of Committee on Memorials
Good of the Association

Car Department Officers' Association

TUESDAY, SEPTEMBER 16

9 a.m.

Address by President G. R. Andersen
Report on Loading Rules
Report on Interchange Rules

2 p.m.

Address by L. L. White, vice-president, C. & N. W.
Car Department Automotive Equipment

WEDNESDAY, SEPTEMBER 17

9 a.m.

Freight Car for Modern Requirements
Passenger-Car Truck Maintenance

2 p.m.—Joint Session

THURSDAY, SEPTEMBER 18

9 a.m.

Address by a railway executive officer
Passenger-Car Painting and Its Maintenance

2 p.m.

Car Lubrication Practices
Election of officers

Railroads "Enlist" in Army's New Organized Reserve Corps

THE railroads have become the first transportation agency to "enlist" in the Army's new Organized Reserve Corps. William T. Faricy, president of the Association of American Railroads, and Brigadier General Paul F. Yount, acting chief of transportation, signed the affiliation agreement on July 2.

The agreement commits the A.A.R. to the sponsoring of three Military Railway Service headquarters and headquarters companies. Also it contemplates that individual roads will sponsor seven M.R.S. grand divisions, 31 railway operating battalions, and 9 shop battalions. The pledge of the railroads is part of the war Department's program to form some 2,500 specialized industry- and civilian-sponsored units of the Organized Reserve Corps for the purpose of having trained manpower available in the event of another national emergency.

The three headquarters units to be sponsored by the A.A.R. correspond to the general offices of a railroad. Each unit will consist of 38 officers and 161 enlisted men. James H. Aydelott, A.A.R. vice-president in charge of the Operations and Maintenance Department, has been designated to represent the association in organizing the officer personel of the units. One of the units will maintain headquarters at New York, another at Chicago, and the third at a location yet to be selected.

Following the signing of the agreement, General Yount announced that individual roads will be asked immediately by the War Department to sponsor operating and shop battalions as they did before World War II. He pointed out that, during the war, there were more than 40,000 skilled railroad men in the M.R.S., operating railroads on all the fighting fronts.

F. B. Foley to Head American Society for Metals

FRANCIS B. FOLEY, superintendent of research of the Midvale Company, has been nominated president of the American Society for Metals. H. K. Work, manager of research and development of the Jones & Laughlin Steel Corp., has been nominated vice-president.

E. G. Bailey A. S. M. E. Nominee for President

E. G. BAILEY, vice-president of the Babcock & Wilcox Company, has been nominated for the office of president of the American Society of Mechanical Engineers for the year 1947-48. Nominees for vice-presidents for two years are: Region 1—Frank M. Gunby, associate of Charles T. Main, Inc., Boston, Mass.; Region 3—Paul B. Eaton, head of the mechanical engineering department, Lafayette College, Easton, Pa.; Region 5—Thomas E. Purcell, general superintendent of power stations, Duquesne Light Company, Pittsburgh, Pa., and Region 7—J. Calvin Brown, head of the firm of J. Calvin Brown, Los Angeles, Calif. Named directors-at-large are: For three years—J. B. Armitage, vice-president in charge of engineering, Kearney & Trecker Corp., Milwaukee, Wis.; for four years, A. L. Penniman, general superintendent of operations, Consolidated Gas, Electric Light & Power Co., Baltimore, Md., and, for four years, William M. Sheehan, vice-president, General Steel Castings Corporation, Eddystone, Pa.

Shop Construction

Baltimore & Ohio.—The B. & O. has awarded contracts to the Ellington Miller Company, Chicago, for the construction of an enginehouse, Diesel fuel facilities and a rest house at Chicago at an estimated cost of $318,600; to the Byrum Construction Company, Wheeling, W. Va., for remodeling an enginehouse and constructing a locomotive washing platform at Benwood, W. Va. ($34,000), and to the George F. Hazelwood Company, Cumberland, Md., for an addition to the engine terminal at M. & K. Junction, W. Va. ($26,000).

Central of New Jersey.—The C. of N. J. has cancelled plans for the construction at Jersey City, N. J., of a Diesel-electric locomotive repair shop which would have cost in excess of $1,800,000. Cancellation was attributed "to the increased cost of construction of the project above our earlier estimates due to the increased cost of labor and material, coupled with the fact that under a decision of the New Jersey court of errors and appeals . . . sustaining the 1942 tax assessment of our Jersey City waterfront and terminal lands we must continue to pay inordinately high taxes on the land on which this shop was to have been located." Additions to the C. of N. J.'s Diesel repair facilities will be made at other points, including Pennsylvania, it was explained, and the land upon which the shop was to have been located will in large part be sold.

Long Island.—The Long Island has awarded a contract to the Salson Construction Company, Jamaica, N. Y., for the construction of an electrical substation building and adjacent facilities at St. Albans, Long Island. The estimated cost of this project is $28,299. A program of improvement in the power distribution system through the construction of mercury arc rectifier substations at Cedar Manor, Kew Gardens, St. Albans and Bellaire, and including the purchase of two portable mercury arc substations, has been authorized. The probable cost is $2,000,000.

Orders and Inquiries for New Equipment Placed Since the Closing of the July Issue

LOCOMOTIVE ORDERS

Road	No. of locos.	Type of loco.	Builder
Baltimore & Ohio	20[1]	3,000-hp. Diesel-elec. frt.	Electro-Motive
Minneapolis & St. Louis	3[2]	1,000-hp. Diesel-elec. road switch	American Locomotive
St. Louis-Southwestern	5	1,000-hp. Diesel-elec. switch	Baldw n Locomotive
	1	2,000-hp. Diesel-elec. frt.	Baldwin Locomotive
Union Pacific	3[3]	6,000-hp. Diesel-elec. pass.	Fairbanks-Morse
	3[4]	2,000-hp. Diesel-elec. pass.	Fairbanks-Morse
	1	1,500-hp. Diesel-elec. frt.	American Locomotive
	3	400-hp. Diesel-elec. switch	General Electric

FREIGHT-CAR ORDERS

Road	No. of locos.	Type of car	Builder
Baltimore & Ohio	25	70-ton flat	Company Shops
Chicago & Eastern Illinois	25	50-ton flat	American Car & Fdry.
	200	50-ton hopper	Pullman-Standard
Chicago, Milwaukee, St. Paul & Pacific	250	70-ton covered hopper	General American
Duluth, Missabe & Iron Range	500	70-ton hopper	General American
	500	50-ton hopper	Pressed Steel Car
	500	70-ton hopper	Pullman-Standard
Great Northern	500	50-ton box	Company shops
Gulf, Mobile & Ohio	300	50-ton box	American Car & Fdry.
	100	50-ton gondola	American Car & Fdry.
Illinois Central	1,500[5]	50-ton hopper	Company Shops
	1,500[5]	50-ton box	Company Shops
New Jersey, Indiana & Illinois	100[6]	50-ton automobile	Pressed Steel Car
Pennsylvania	1,000	50-ton box	Company Shops
Detroit & Toledo Shore Line	100	70-ton covered hopper	General American
Union Pacific	400	70-ton covered hopper	General American
Western Fruit Express	400	40-ton refrigerator	American Car & Fdry.

FREIGHT-CAR INQUIRIES

Road	No. of cars	Type of car	Builder
Reading	1,000	50-ton box	
Union Pacific	1,000	50-ton box	
Wheeling & Lake Erie	1,000	70-ton hopper	

[1] Delivery scheduled for the first quarter of 1948. The B. & O. has also purchased 10 Mallet steam locomotive from the Seaboard Air Line.
[2] Delivery scheduled for September, 1948.
[3] Delivery expected February, 1948. Approximate cost $1,250,000.
[4] Two A and one B unit.
[5] Construction of the hopper cars scheduled for the first half of 1948. The box cars will be built during the second half of 1948.
[6] Construction expected to begin in December.

NOTES:—The *Pullman-Standard Car Manufacturing Company* has begun commercial deliveries of its new "rapid-production" P-S-I box car, the first of nearly 10,000 cars of this type being built, according to Wallace N. Barker, executive vice-president. Mr. Barker said that "with its greater standardization in design," the new-type box car "will mean lower cost to its railroad purchasers." The company itself manufactures a portion of the component parts of the car. The first shipment of the cars went to the Lehigh Valley and, according to Mr. Barker, 11 other railroads have placed orders. Six thousand of the units will be built at the Michigan City (Ind.) plant and others will be constructed at the Bessemer (Ala.) shops.

The *Southern Pacific* plans to augment its fleet of streamliners by the purchase of two complete "City of San Francisco" trains so that this now tri-weekly Chicago-San Francisco service may be placed on a daily schedule. Including the cost of the two 6,000-hp. Diesel-electric locomotives to power the trains, a total expenditure of over $5,000,000 is called for. Acquisition of 42 additional cars is involved, including baggage and crew dormitory cars, dining cars, all-room sleepers, chair, lounge and lounge-observation cars. This equipment will be in addition to the five Diesel locomotives and 52 lightweight passenger cars ordered in 1946, upon which delivery is only now commencing. Delivery of the latest order is not anticipated until the latter part of 1948.

The *Wabash* has announced that a new seven-car lightweight streamliner, to cost $1,000,000, is under construction and will be placed in operation between Kansas City, Mo., and St. Louis. The new Diesel-powered train, to be known as the "City of Kansas City," will augment the existing service offered by the "City of St. Louis," for which streamline equipment, purchased jointly with the Union Pacific, is on order.

Supply Trade Notes

SKF INDUSTRIES, INC.—A two-year modernization and expansion program costing over $4,000,000 has been announced by SKF Industries, Inc. The bulk of the expenditures will go for new machinery for the company's two Philadelphia, Pa., plants. Program is aimed primarily at increasing the production of spherical roller bearings.

Roy C. Norton, Jr., has been appointed a field engineer in the Hartford, Conn., district office of SKF, and *I. J. Torkelson*, field engineer at Chicago, has been transferred to the branch office at Milwaukee, Wis. *R. M. Parrish* has been appointed to the sales staff of the district office at Portland, Ore.

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CUMMINS ENGINE COMPANY.—*R. E. Huthsteiner*, vice-president and general manager of the Cummins Engine Company, has been elected a director of the company to succeed the late *Hugh T. Miller; H. L. Knudsen*, vice-president of engineering, has resigned but will continue as a director of the firm. *D. J. Cummins* has been appointed manager of engineering and quality to assume most of Mr. Knudsen's former duties.

◆

INLAND STEEL COMPANY.—*John J. Davis, Jr.*, has joined the staff of the Inland Steel Company, at Chicago, and will become manager of sales, railroad division, on January 1, 1948, when he will succeed to the full responsibilities of *William J. Hammond*, vice-president and manager of sales, railroad division, who will retire on that date.

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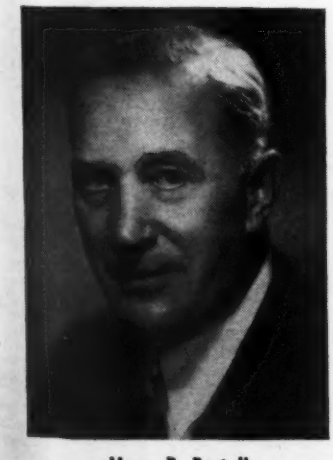
GENERAL STEEL CASTINGS CORPORATION.—*Harry R. Bartell* has been appointed assistant vice-president-sales of the General Steel Castings Corporation and *James W. Cooke* district manager-sales, with headquarters at Eddystone, Pa.

Harry R. Bartell started his career in the



Harry R. Bartell

office of the mechanical engineer of the New York Central in Cleveland, Ohio, and later was car designer for the Atlas Car & Manufacturing Co. in Cleveland. He joined the Commonwealth Steel Company in 1916, where he worked in the engineering department, later representing that firm and its successor, General Steel Castings, as sales engineer. In 1931 he was appointed manager, western district sales. Mr. Bartell will continue in charge of district sales with headquarters at Granite City, Ill.

James W. Cooke is a graduate of Prince-

James W. Cooke

ton University (1930). He entered the service of General Steel Castings in 1937 and worked several years in the production and service departments before joining the sales organization as representative for New England and middle western railroads.

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ALUMINUM COMPANY OF AMERICA.—*Ralph V. Davies*, former assistant general sales manager of the Aluminum Company of America, has been appointed vice-president and general sales manager, to succeed *George J. Stanley*, who has retired. Mr. Stanley will continue also as a director of the company and a number of its subsidiaries. *Robert B. McKee* and *Donovan Wilmot*, also assistant general sales managers, have been appointed vice presidents along with Mr. Davies.

Ralph V. Davies joined the company in 1919 as a metallurgist at the New Kensington, Pa., works. He later served successively in the sales offices at Rochester, N. Y., Buffalo, and Washington, D. C. He was appointed manager of the Washington office in 1928, and manager of the New York office in 1930. In 1943 he was appointed product manager for ingot sales, with headquarters in Pittsburgh, Pa., and, in 1944, assistant general sales manager in charge of the company's sales engineering and sales development activities.

Mr. Stanley joined the Pittsburgh Reduction Company (now the Aluminum Company of America) in 1905. In 1909 he was appointed sales manager in Rochester, N. Y., and ten years later assistant general sales manager in charge of ingot sales, with headquarters in Chicago. He became vice-president of the United States Aluminum Company, in 1922, and general sales manager of the parent firm in 1928. Three years later he was appointed vice-president of the Aluminum Company and, in 1939 he was elected a director.

AIR REDUCTION SALES COMPANY.—The Air Reduction Sales Company has opened new oxygen plants at Decatur, Ill., and Baton Rouge, La., under the supervision respectively of *George H. Klingenberg* and *J. L. West*.

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GRIFFIN WHEEL COMPANY.—*Charles E. Barnes*, general sales manager of the Griffin Wheel Company at Chicago, has been elected vice-president in charge of sales, succeeding *Carter P. Whitcomb*, retired.

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INTERNATIONAL NICKEL COMPANY.—*Joseph M. Weldon*, formerly in charge of the aeronautical division of the alloys sales department of the International Nickel Company, has been appointed assistant to vice-president H. J. French.

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IRON & STEEL PRODUCTS, INC.—*Basil Fenn-Anstruther* has been appointed representative of Iron & Steel Products, Inc., for the states of California, Nevada, and Arizona, with headquarters at 416 West Eighth street, Los Angeles 14, Calif.

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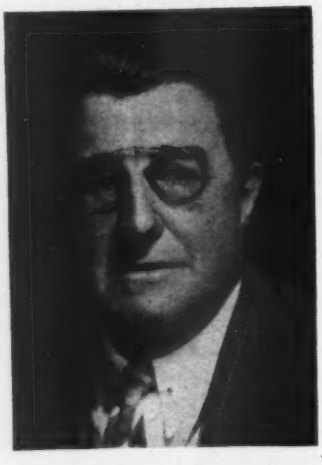
AMERICAN CAR AND FOUNDRY COMPANY.—*Rudolph Furrer* has been elected vice-president in charge of engineering of the American Car and Foundry Company, to succeed *Edmund Dana Campbell*, who has retired for reasons of health after 43 years' service. Earlier in his career, Mr. Furrer was associated successively with the Allis-Chalmers Manufacturing Company, the A. O. Smith Corporation, and the United States Steel Corporation. *Morris S. Evans*, former district manager of the Buffalo,

Rudolph Furrer

N. Y., plant, has been appointed manager of the estimating division, with headquarters in New York, to assist Mr. Furrer. Mr. Evans worked at the company's Berwick, Pa., plant in 1913 and during later summer months while attending college. After graduation he became a full-time employee and later served successively as superintendent, improvement and maintenance, local engineer, and assistant to the district manager. He was appointed district manager of the Buffalo plant in 1940.

PRESSED STEEL CAR COMPANY.—*John F. MacEnulty,* chairman of the board of directors of the Pressed Steel Car Company has retired, but will continue to be available to the company on a consultative basis.

John F. MacEnulty joined Pressed Steel Car shortly after its organization in January, 1899. He first worked as a car inspector in the Allegheny plant and steadily advanced through various departments until 1916 when he became a vice-president. He was elected a director in 1922; vice-president and general manager in 1936, and president in December, 1937. Mr. MacEnulty was elected vice-chairman of the board in April, 1945, and chairman on June 13, 1946. He was president of the American Railway Car Institute for many years and at present is a director of the institute.



John F. MacEnulty

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BETHLEHEM STEEL COMPANY.—The following changes have been made in the sales personnel of the Bethlehem Steel Company: *J. M. Ellis,* formerly general manager of sales and *M. C. Schrader,* formerly assistant to the general manager, have been appointed assistants to the vice-president; *K. L. Griffith,* formerly assistant general manager of sales, has been appointed general manager of sales; *D. C. Roscoe,* formerly manager of sales, sheets and strip, has been appointed assistant general manager of sales, and *A. T. Hunt,* formerly manager of sales, galvanized sheets and formed products, has been appointed manager of sales, sheets and strip.

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GRIP NUT COMPANY.—*C. A. Henrickson* has been appointed assistant mechanical engineer of the Grip Nut Company, with headquartsrs at the general offices, 310 South Michigan avenue, Chicago 4.

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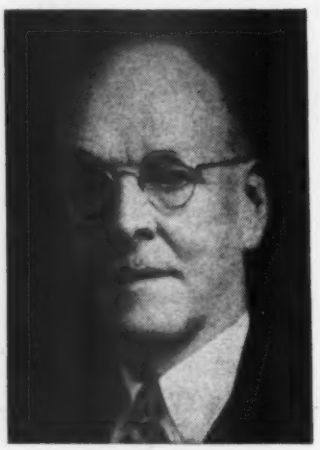
ALLIS-CHALMERS MANUFACTURING COMPANY.—The Allis-Chalmers Manufacturing Company has announced the formation of a new turbo-power development department in its engineering development division. *R. C. Allen,* formerly manager of the steam-turbine department, has been appointed manager and chief engineer of the new department and *W. A. Yost,* formerly assistant manager, succeeds to Mr. Allen's former duties.

BULLARD COMPANY.—*E. Payson Blanchard,* sales manager of the Bullard Company, Bridgeport, Conn., has been appointed director of sales, and *Frank U. Hayes,* assistant sales manager, has been appointed sales manager. Mr. Blanchard will be in charge of general administrative sales policies and Mr. Hayes will be responsible for executive sales functions.

E. Payson Blanchard was born in Uxbridge, Mass. He received his education at Brown University, Class of 1912, and through continuation courses. His work in the earlier years of his career was in granite quarrying and cutting. His career in the tool business began with the Osgood-Bradley Car Company where he spent three years designing tools and dies for the tooling and construction of steel passenger cars. For six years he was with the Boston Pressed Metal Company in tool and die design, production control, cost accounting, sales, and as assistant to the general manager. He became associated with the Bullard Company as an engineer in 1920 and subsequently became advertising manager, assistant sales manager, and, in 1932, sales manager and a director. Mr. Blanchard is a member of the American Society of Mechanical Engineers and the Society of Automotive Engineers.



E. P. Blanchard

Frank U. Hayes is a graduate of Lowell Institute at Cambridge, Mass. He was associated with the Baldwin Locomotive Works, Philadelphia, Pa., before entering the tool plant of the Bullard Company in 1935. Within the next year he was assigned to the sales division, Middle Atlantic states. In March, 1941, he was assigned by the Bullard Company as a technical advisor, Tool Section, Production Division, Office of Production Management. On his return to Bullard his assignment was the setting up of a sub-contracting division. Mr. Hayes was appointed assistant sales manager in 1942.

F. U. Hayes

◆

LINK-BELT COMPANY.—*Harold L. Hoefman,* general manager of the Pershing Road (Chicago) plant of the Link-Belt Company, has been elected vice-president in charge of manufacturing at Chicago. *David E. Davidson,* head of the engineering department at the Pershing Road plant, has been appointed general manager. Other appointments have been made at the Pershing Road plant as follows: *R. W. Rausch,* assistant chief engineer, has become chief engineer, succeeding *C. S. Huntington,* who has retired. *H. W. Regensburger,* assistant to the vice-president in charge of engineering at the executive offices, has become divisional engineer in charge of estimate engineering. *E. P. Berg,* who has served as assistant to the president since the recent death of *E. L. Berry,* vice-president in charge of production, is now general superintendent. *J. C. Spence,* general superintendent since 1942, has been appointed assistant to *H. L. Hoefman,* vice-president in charge of manufacturing, at the executive offices, 307 North Michigan Avenue, Chicago.

◆

MINES EQUIPMENT COMPANY.—*Carl G. Howard* has been appointed Chicago sales representative for the Mines Equipment Company of St. Louis, Mo., for the sale of electrical connectors and cables in the railway and industrial field. *Jack Gould,* formerly associated with the Copperweld Steel Company, at Chicago, has joined Mr. Howard in the sale of Mines Equipment Company products.

◆

OKONITE COMPANY.—The Okonite Company has announced the opening of a new sales office at 626 Broadway, Cincinnati, Ohio. *S. W. Pollock,* in charge of the new office, will handle sales in southern Ohio.

◆

HANNA ENGINEERING WORKS.—The *Valley Bearing & Equipment Co.* has been organized with its main office at 39 South La Salle street, Chicago, to handle sales of

Trade Publications

CRANES.—Conco Engineering Works, Mendota, Ill., eight-page catalog No. 3000 illustrates and describes in detail the Conco line of hand-powered and electric cranes, hoists and trolleys.

◆

PISTON RINGS.—Hunt-Spiller Manufacturing Corporation, South Boston, Mass. Twelve-page catalogue, "From Cannon Balls to Piston Rings," outlines "Almost a Century-and-a-Half of Progress" of the Hunt-Spiller Company, then describes the Hunt-Spiller double seal rings for Diesel engines, gas engines, steam engines, refrigerating compressors, pumps, etc.

The Tough Guy is too busy to gripe about the beating he takes. Like the good Chilled Car Wheel he is, he takes year after year of punishing service and gives as good as he receives.

We at AMCCW lay the ground work for better wheel performance by providing wheel manufacturers with a code of practice. Firm adherence to this code is demanded as a condition of continuing membership. Helping us to achieve our aim of uniform specifications . . . uniform inspection . . . uniform product is a technically trained staff of resident inspectors, general inspectors and metallurgical and engineering personnel.

Then, too, our testing and research facilities include all the equipment necessary to insure that wheel standards advance steadily.

AMCCW

ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS
445 NORTH SACRAMENTO BOULEVARD, CHICAGO 12, ILL.

American Car & Foundry Co. • Canadian Car & Foundry Co. • Griffin Wheel Co.
Marshall Car Wheel & Foundry Co. • Maryland Car Wheel Co. • New York Car Wheel Co.
Pullman-Standard Car Mfg. Co. • Southern Wheel (American Brake Shoe Co.)

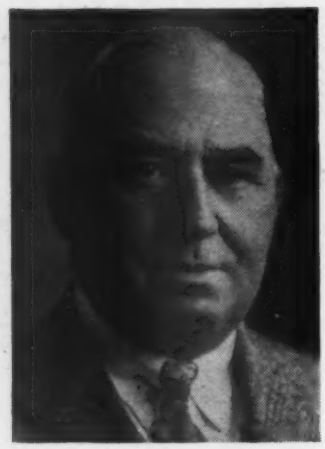
the Hanna Engineering Works' "Glide-Ride" air cylinder. *Jean R. Huff*, president of the company, has announced that the Philadelphia, (Pa.) area will be represented by *Paul H. Griffith*, with offices at 1381 Broad Street Station building, Philadelphia 3; the West Coast area by *Joseph M. Welles*, 112 West Ninth street, Los Angeles, Calif.; and the St. Paul (Minn.) area by *Robert J. Wylie*, 612 Pioneer build-

◆

AMERICAN STEEL FOUNDRIES.—*F. H. Bassett*, sales agent representing American Steel Foundries in certain western territory, has been placed in charge of all western territory to succeed *F. S. McNamara*, who retired on June 30.

F. H. Bassett joined American Steel in 1924, immediately after his graduation from Cornell University with a degree in mechanical engineering. After completing a special training course at various A.S.F. plants he was transferred to sales in the Chicago district. In 1942 he began three years' service as an officer in the Navy. In 1945 Mr. Bassett returned to American Steel Foundries as sales agent in the Denver, Colo., area, where he now has headquarters in new offices, rooms 503-4, Boston building, Denver 2.

F. S. McNamara was born in Detroit,



F. S. McNamara

Mich. He started his career in 1893 as an office boy with the Grand Trunk (now part of the Canadian National system). He served successively as storekeeper at Battle Creek, Mich., and Portland, Me.; as general clerk to the master mechanic at the Point St. Charles shop; as general storekeeper of the Denver & Rio Grande, the Colorado & Southern and the Fort Worth & Denver City, when these three roads had a common stores department; as general manager for the Santa Fe, Raton & Eastern; as vice-president of the Yankee Fuel Company; and as vice-president of the Colorado Grey Iron Foundries.

◆

STANDARD RAILWAY EQUIPMENT MANUFACTURING COMPANY.—*Vinton E. Sisson*, vice-president—patents of the Standard Railway Equipment Manufacturing Company, has retired, following 36 years of service with the firm. Mr. Sisson joined the company in 1911 as mechanical engineer, subsequently advancing to sales engineer and patent counsel. He had served as vice-president—patents, since 1922. As a result of Mr. Sisson's retirement, *Karl T. Nystrom* has become manager, patent and development department, with *Sabin C. Bronson* as patent counsel and *A. L. Thompson*, assistant manager, development department.

◆

GLOBE STEEL TUBES COMPANY.—*T. R. Coffey* has been appointed manager of sales of the Detroit, Mich., and *D. F. Wenzel*, manager of sales of the Wisconsin office of the Globe Steel Tubes Company. Mr. Wenzel's headquarters are in Milwaukee, Wis.

T. R. Coffey has been associated with

T. R. Coffey

Globe Steel Tubes since 1928, serving in various capacities in the general sales department. He was appointed manager of sales of the Milwaukee, Wis., office in 1943.

D. F. Wenzel

D. F. Wenzel has been associated with the Globe company for the past eleven years in the general sales office. He succeeds Mr. Coffey.

◆

CORNING GLASS WORKS. — *Arthur S. Tylor*, former manager of the lighting sales department of the Corning Glass Works, has been appointed general sales manager of the technical products division, to succeed *John W. Romig*, resigned. *William J. Belknap*, formerly manager of the market research department, will succeed Mr. Tylor in the lighting sales department.

VAPOR CAR HEATING COMPANY.—*N. O. Kirkby* has been appointed director of research of the Vapor Car Heating Company of Chicago. Mr. Kirkby served previously in the company's sales and service department. Before joining Vapor, he was an assistant mechanical engineer of the Chicago, Burlington & Quincy.

◆

MIDVALE COMPANY.—*Richard T. Nalle* has been elected president of the Midvale Company, to succeed *Francis Bradley*, who has been elected chairman of the board of directors.

◆

EATON MANUFACTURING COMPANY.—*Edward J. Helline* has been appointed general sales manager of the Reliance division of the Eaton Manufacturing Company,

Edward J. Helline has been with Eaton for twenty-eight years, starting as mail

Edward J. Helline

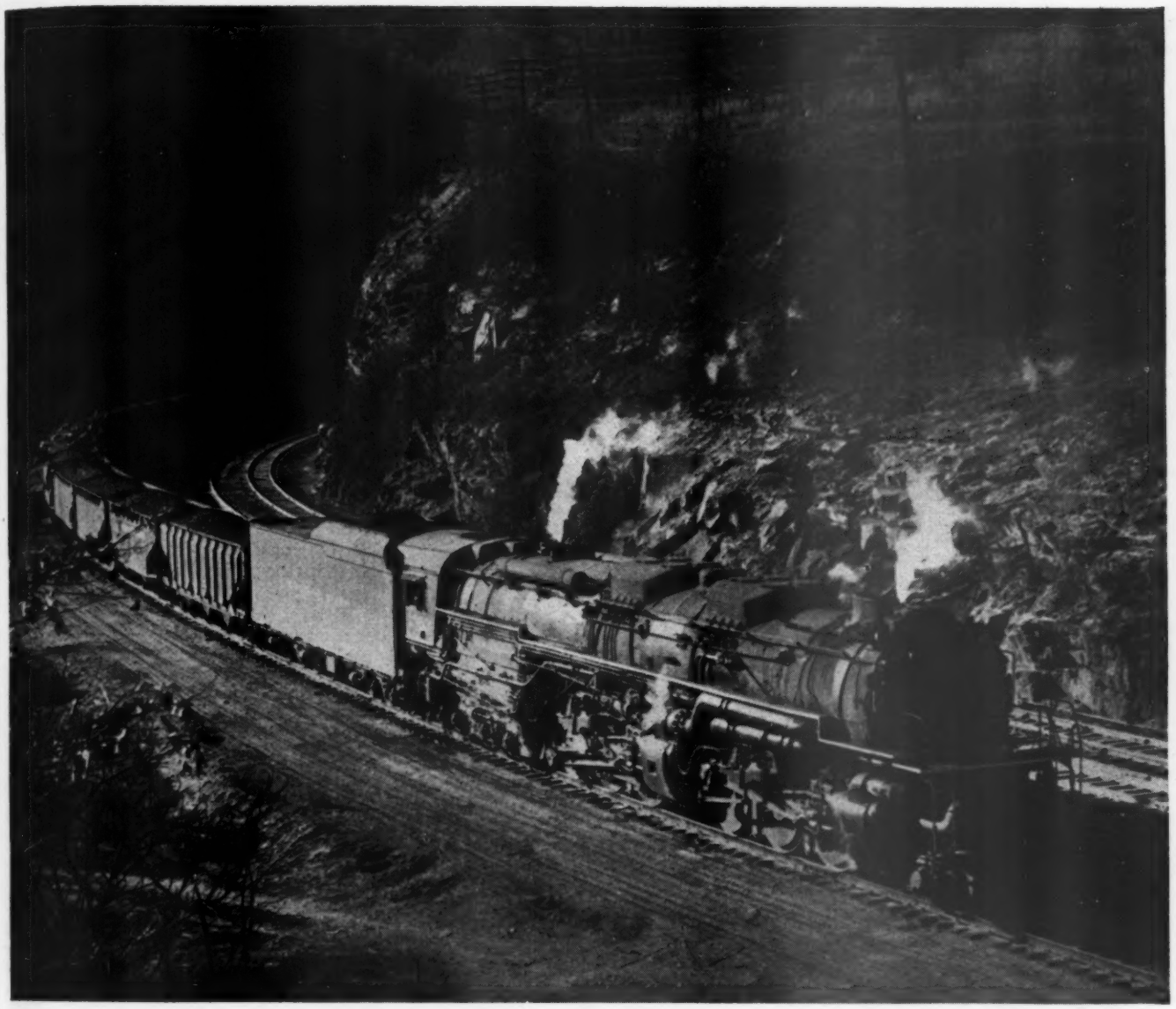
clerk and serving as manager of the order and billing department, manager of the service department and assistant to the general sales manager. For the past three years he has been in charge of snap ring sales engineering and promotion.

◆

NATIONAL ALUMINATE CORPORATION.—*H. A. Marshall*, assistant to the vice-president, has been appointed assistant vice-president of the National Aluminate Corporation, with headquarters as before at New York. *J. L. Gibboney*, assistant to the vice-president, at Indianapolis, Ind., has been appointed assistant vice-president, with headquarters at Indianapolis. *L. S. Heasom*, assistant manager, railway service, at Chicago, has been appointed assistant to the vice-president, with headquarters at Chicago, succeeding *H. H. Richardson*, deceased. *R. G. Bielenberg*, railway service representative at Waverly, N. Y., succeeds Mr. Heasom as assistant manager, railway service, at Chicago.

◆

KENNAMETAL, INC., has appointed as representatives *Walter C. Lavers*, *Joseph F. Liebscher* and *Richard H. Oberholtzer*, formerly application engineers of Kennametal, Inc., Mr. Lavers and Mr. Liebscher to serve the South Pacific district, with headquarters in Los Angeles, Calif., and Mr. Oberholtzer the Detroit, Mich., area with headquarters in that city. Also appointed representatives are *Ralph L. Miller* in the Reading, Pa., area, with



traffic demands
must be anticipated

BECAUSE equipment can not be built "overnight," traffic demands must be anticipated for long periods in advance. So, versatile motive power is especially important—locomotives capable of speeding passenger traffic or handling heavy freights with equal facility and economy of operation.

Lima-built modern steam locomotives meet these requirements and provide the superior performance that results from Lima's insistence upon the highest standards of design, workmanship and material.

LIMA LOCOMOTIVE WORKS LIMA LOCOMOTIVE WORKS INCORPORATED **INCORPORATED, LIMA, OHIO**

headquarters in Philadelphia, Pa.; *Charles Herbert Bodner,* tool engineer and representative in the Los Angeles area, and *John H. Wright* in the New England district. Added to the company's staff of application engineers are *Dalton Huston* and *D. C. Cunningham,* both at Detroit, *Hugh A. Pilling* at Philadelphia, and *Frank E. Ryan, Jr.,* with headquarters at Springfield, Mass. *Gilbert A. Bunn* has been appointed Philadelphia district manager, with headquarters at Philadelphia.

◆

AMERICAN LOCOMOTIVE COMPANY.—*James E. Davenport,* vice-president of the American Locomotive Company, has resigned. Mr. Davenport had been in charge of engineering, development and research for the company since 1940.

◆

WILSON ENGINEERING CORPORATION.—The Wilson Engineering Corporation, Chicago, has appointed *Allen-O'Neill Associates,* 219 Ninth Street, San Francisco 3, Calif., as its Pacific coast representatives.

◆

KELITE PRODUCTS COMPANY.—The Atlantic states interests of Kelite Products, Inc., manufacturers of industrial chemicals for cleaning and processing have been taken

Gene Goble

over by the Kelite Products Company, under the direction of *Gene Goble.* Mr. Goble also is president and general manager of Goble Aircraft Specialties, Inc.

◆

CHICAGO RAILWAY EQUIPMENT COMPANY.—*A. C. Moore,* president of the Chicago Railway Equipment Company, Chicago, has been elected to the newly created position of chairman of the board. Mr. Moore will continue as chief executive officer of the company, and exercise general supervision and control over its affairs. *S. J. Walker,* executive vice-president, has been elected president.

◆

VANADIUM CORPORATION OF AMERICA.—*C. S. Munson, Jr.,* formerly assistant to the executive vice-president of the Vanadium Corporation of American, has been appointed assistant to the president.

◆

Theodore E. Burke, formerly with the Republic Steel Corporation, has joined the Vanadium Corporation of America as sales engineer in the railroad division, with headquarters in Chicago.

◆

DEARBORN CHEMICAL COMPANY.—*E. T. Erickson* has been appointed to head the Chicago city sales department of the Dear-

E. T. Erickson

born Chemical Company. Mr. Erickson has been chemical engineer in the company's water treating division for the past three years.

◆

EVANS PRODUCTS COMPANY.—The loading division of the Evans Products Company, Plymouth, Mich., has announced the opening of a new Chicago office. *Kenneth J. Tobin,* in charge of the new office, will direct promotion of railroad equipment manufactured by Evans.

◆

CARNEGIE-ILLINOIS STEEL CORPORATION.—*John R. Johnston,* sales manager in the Milwaukee (Wis.) district office of the Carnegie-Illnois Steel Corporation, has been appointed assistant general sales manager, with headquarters at Pittsburgh, Pa. *Charles E. McIntyre,* assistant manager of the district sales office at Detroit, Mich., has been appointed sales manager of the district sales office at Milwaukee, succeeding M. Johnston.

The Chicago sales units of the Carnegie-Illinois Steel Corporation (a subsidiary of the United States Steel Corporation) have been combined under the direction of *G. A. Price,* manager of the Chicago district sales office. *E. W. Backes* has been appointed railroad industries sales manager; *J. H. Morava,* manufacturing industries sales manager, and *G. O. With,* construction industries sales manager.

◆

MODERN SUPPLY COMPANY.—*Donald G. Patton* has joined the Modern Supply Company, with headquarters in Chicago.

Obituary

H. H. RICHARDSON, assistant vice-president of the National Aluminate Corporation, Chicago, died in that city on July 5.

◆

NORMAN WILSON STORER, former consulting railway engineer of the Westinghouse Electric Corporation, died on June 5, at his home in Winter Park, Fla. He was 79 years old.

◆

HARRY A. MAURER, former General Superintendent, Director and Secretary of The Oster Manufacturing Company of Cleveland, Ohio, died on June 17, 1947 after an illness of several months. He was seventy years of age.

◆

AUGUST H. TUECHTER, president of the Cincinnati Bickford Tool Company since 1909, died on May 17.

◆

NELSON F. BURNS, sales representative of the Vapor Car Heating Company, died at Chicago on May 27. Mr. Burns was born on January 12, 1875. He entered the service of the Vapor company on January 1, 1919. Prior to then he had served five years with the Pullman Company, and 24 years with the New York Central. At the time of his death he was special representative for the vice-president at Chicago.

◆

PHILIP H. SIMPSON, manager of railway sales, Eastern district, K. W. Battery Company, died May 29, 1947, after a period of ill health. Mr. Simpson was born in Brooklyn in 1886, and spent his entire business career in the railroad field. He started his career in the New York office of the Gould Storage Battery Company in 1907 and continued with the Gould Company until it was sold. He later served for a period of about one year with the Edison Storage Battery Company, and in May, 1930, joined the K. W. Battery Company as manager of railway sales.

Personal Mention

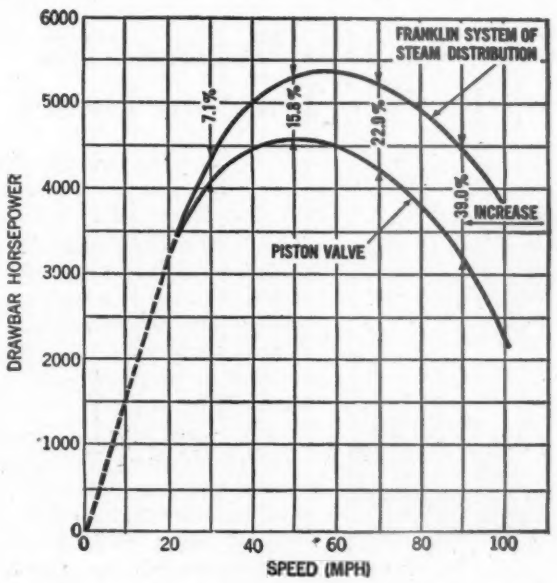
General

WILLIAM MARTIN, general mechanical inspector of the Missouri Pacific at St. Louis, Mo., has retired.

P. E. OAKES, general supervisor of locomotive maintenance of the Chicago, Indianapolis & Louisville at LaFayette, Ind., has been appointed mechanical division assistant, with headquarters at LaFayette. The former position has been abolished.

JOHN PFEIFFER, whose retirement as superintendent of motive power of the Fort Worth & Denver City and the Colorado & Southern, (parts of the Chicago, Burlington & Quincy), with headquarters at Denver, Colo., and Childress, Tex., was reported in the July issue, was born at Creston, Iowa, on May 25, 1875. He entered railroad service in 1892, as a wiper on the Burlington, at Creston, and served in various minor capacities until 1914, when he became general foreman, at Quincy, Ill. In 1915 he was appointed master mechanic,

MORE POWER



This curve shows a comparison of horsepower at rear of tender for a modern locomotive when equipped with piston valves and when equipped with the Franklin System of Steam Distribution. In both cases, steam consumption by the engine is 90,000 lbs. per hour.

Computations based on:

Type 4-8-4

Cylinders 25" x 32"

Driving Wheels 80"

Boiler Pressure 300 lb

Steam Temperature 730° F

Total Heating Surface 4225 sq ft

Grate Area 100.2 sq ft

from a locomotive equipped with the Franklin System of Steam Distribution

This curve shows the improvement in horsepower output that may be expected from a modern locomotive when it is equipped with the Franklin System of Steam Distribution.

FRANKLIN RAILWAY SUPPLY COMPANY, INC.

NEW YORK • CHICAGO • MONTREAL

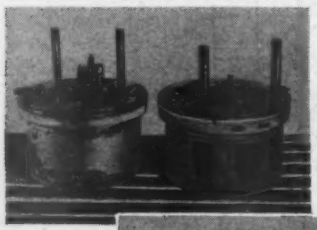
STEAM DISTRIBUTION SYSTEM • BOOSTER • RADIAL BUFFER • COMPENSATOR AND SNUBBER • POWER REVERSE GEARS
AUTOMATIC FIRE DOORS • DRIVING BOX LUBRICATORS • STEAM GRATE SHAKERS • FLEXIBLE JOINTS • CAR CONNECTION

Magnus

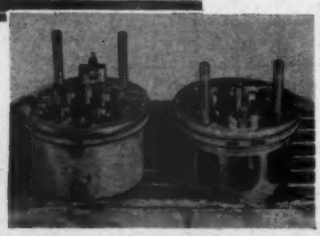
Newsworthy Items for Those Concerned with Industrial Cleaning and Related Problems

Vol. 1 August, 1947 No. 2

Aja-Dip Cleaning with Magnus 755 Saves up to 90% Time on Diesel Parts



Before Cleaning



After Cleaning

With that unique emulsion-solvent cleaner, Magnus 755, plus the dynamic agitation of the cleaner provided by the Magnus Aja-Dip Cleaning Machine, you get thorough cleaning of all diesel parts with virtually no manual work and in a fraction of the time required by ordinary methods. The unit shown to the left was cleaned, without hand brushing, in less than two hours. Similar parts used to take from 24 to 30 hours by the solvent-soak, hand brushing method.

The line of Magnus Aja-Dip Cleaning Machines is broad enough to cover every phase of railroad cleaning, from the processing of small batches of heavily carbonized parts to the handling of a complete diesel block.

For Those Stubborn Deposits on Diesel Train Car Tops

The discolorations and stains caused by the locomotive exhaust fumes on the tops of following coaches do not readily respond to ordinary car cleaning compounds. Magnus 77, a special solvent type of cleaner, has been in steady use on this type of dirt almost from the day the first streamliner took to the rails.

The cleaner is worked into the deposit with a brush and allowed to soak in for a few minutes. Then dirt and cleaner are flushed away with water.

Cut Lost Time with a SAFE Hand Cleaner

It has been proved beyond any doubt that harsh, abrasive hand cleaning materials are the cause of a lot of the infections and dermatoses which contribute to the lost time factor in shop operations.

Standardize on Magnus Hand Cleaner for safe but speedy hand cleaning. No harsh chemicals. Mild but effective scouring action. Leaves hands smooth, without robbing skin of its natural oils. And it works faster than gritty, dangerous sand soaps!

NEW CLEANING IDEAS

For Further Details Write Magnus

You Don't Have to Dismantle to Clean Shop Machines. No matter how greasy and dirty they are, just spray with Magnusol-kerosene mixture and let it soak in. Then pressure rinse with water. No heat required. Safe for all metals and coatings. No. 113

•

Put "Wetting" to Work when You Clean Up in the Engine Room. Magnus 10-X is a mild alkaline cleaner with powerful added wetting action. You use a 2 oz. per gallon solution to wipe over all surfaces to be cleaned, followed by drying off with a clean cloth. Removes all oily dirt, but is harmless to finishes. No. 114

•

Magnusol for Cleaning All Types of Air Filters. Use one part Magnusol concentrate to 8 parts kerosene or mineral oil. Soak filters, then flush clean with water. No. 115

•

Keep Your Fuel Oil Sludge-Free with Magnus Clerex. Just a few drops per gallon of oil will inhibit sludge formation. You can also use Clerex to disperse existing sludge deposits in your storage tanks. No. 116

Magnus Chemical Co., 77 South Ave., Garwood, N. J. In Canada—Magnus Chemicals, Ltd., 4040 Rue Masson, Montreal 36, Que.

and served at Centerville, Iowa, Chicago, and Beardstown, Ill. Mr. Pfeiffer was appointed superintendent of motive power of the F. W. & D. C. in 1919 and also superintendent of motive power of the C. & S. in 1936.

L. A. McAllister has been appointed mechanical engineer of the Chicago, Indianapolis & Louisville at LaFayette, Ind. Mr. McAllister was previously mechanical engineer of the Alton at Chicago.

V. C. Golden, superintendent of Diesel locomotive maintenance and operation of the Chicago, Indianapolis & Louisville, has been appointed general mechanical assistant, with headquarters as before at LaFayette, Ind. A sketch of Mr. Golden's career appeared in the June issue.

O. S. Rimes has been appointed acting mechanical foreman of the Atlantic Coast Line at St. Petersburg, Fla.

W. D. Friend, general mechanical inspector of the Missouri Pacific at Houston, Tex., has been appointed general mechanical inspector, with headquarters at St. Louis, Mo.

L. L. Hoeffel, superintendent of motive power and machinery of the Union Pacific at Salt Lake City, Utah, has been appointed to the newly created position of mechanical superintendent of steam power, with headquarters at Omaha, Neb.

A. T. Miller, assistant superintendent motive power and master mechanic of the Atlanta & West Point, the Western of Alabama, the Georgia and the Atlanta Joint Terminals, has been appointed superintendent motive power of these roads, with headquarters at Atlanta, Ga.

A. V. Nystrom, district general car foreman of the Chicago, Milwaukee, St. Paul & Pacific, at Chicago, has been appointed assistant general superintendent locomotive and car departments, with headquarters at Milwaukee, Wis.

J. D. Muir, superintendent motive power and car department of the Canadian Pacific at Toronto, Ont., has retired under the pension rules of the company. Mr. Muir entered railroad service in 1905 as a machinist in the employ of the Canadian Pacific at Moose Jaw, Sask. Four years later he became shop foreman, subsequently transferring to Calgary, Alta. From 1910 to 1916 he was locomotive foreman, serving successively at Calgary, Medicine Hat, Alta., and Winnipeg, Man. In 1917 he was appointed general foreman, motive power department at Vancouver, B. C.; in 1919 assistant works manager at the Angus shops at Montreal, and in 1928 assistant superintendent motive power and car department of the Western lines at Winnipeg. He held the latter position until October, 1937, except for a time in 1933 when he served as acting superintendent motive power and car department of the Eastern lines. Mr. Muir became superintendent motive power and car department of the Eastern lines at Toronto in October, 1937.

F. O. Walsh, superintendent motive power of the Atlanta & West Point, the Western of Alabama, the Georgia, and the Atlanta Joint Terminals, at Atlanta, Ga., has retired at his own request after 45

Engine and generator are perfectly balanced—power output and speed completely synchronized. There's no drop in the performance curve. For each throttle position, a constant horsepower output is maintained.

Tamperproof safety features provide automatic protection in emergencies. Should lube oil pressure run low, or a blocked passage cause pump suction to rise too high, the governor shuts the engine down, rings an alarm in all units, and flashes a light in the unit affected.

The safety devices cannot be reset or blocked out until the trouble is remedied; bearings and crankshaft can never run with insufficient oil pressure.

Easily accessible for adjustment and servicing, this compact, foolproof governor is the latest example of the advanced engineering features which give the F3 the widest scope of services in the world.

It's another evidence of Electro-Motive's years of pioneering and research — a matchless result of two and a half decades spent acquiring intimate knowledge of internal combustion engines and control of electrical transmission.

GENERAL MOTORS LOCOMOTIVES

ELECTRO-MOTIVE DIVISION

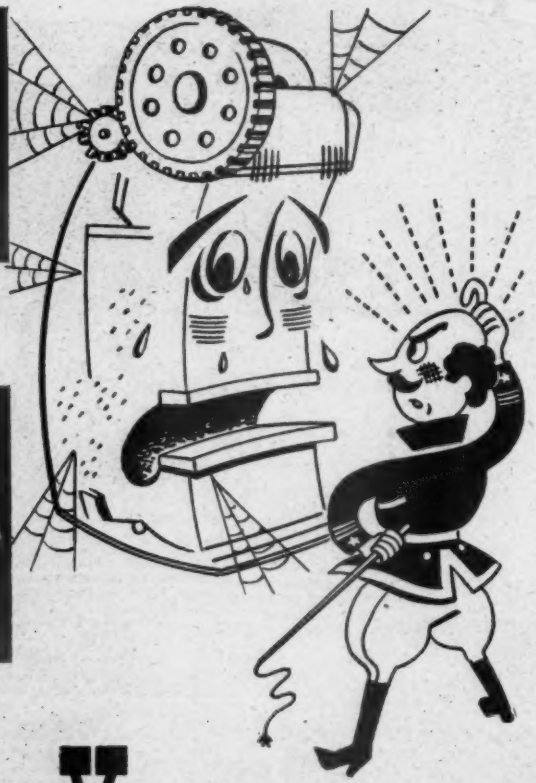
GENERAL MOTORS LA GRANGE, ILL.

BEATTY No. 14 Toggle Punch for structural steel fabrication.

BEATTY No. 11-B Heavy Duty Punch extensively used in railroad industry.

BEATTY Horizontal Hydraulic Bulldozer for heavy forming, flanging, bending.

BEATTY 250-ton Gap Type Press for forming, bending, flanging, pressing.



You can't teach an OLD dog NEW tricks!

Any basic improvement in your production technique will usually call for custom-built equipment — designed to do a specific job in a *better, faster,* more *economical* way. Our experience in many fields qualifies us both to help you work out that better production technique and to design and build heavy metal working equipment that will make those improved techniques practical. There is a *better way* to handle most production problems. Our specialty is to help you find that *better way.*

BEATTY MACHINE AND MFG. COMPANY
HAMMOND, INDIANA

years of service. Mr. Walsh was born at Memphis, Tenn., on March 5, 1873. He entered railroad service in June, 1888, with the Louisville & Nashville, serving until March, 1893, as a machinist apprentice and as a machinist. Mr. Walsh then became fireman and engineer, successively, in the employ of the Louisville & Nashville and from August, 1895, to November, 1899, was general foreman and master mechanic of the L. & N. On the latter date he became master mechanic of the Western of Alabama; chief mechanical officer of the Brazil railroad at Sao Paulo, Brazil, in March, 1911, and superintendent motive power and equipment of the Georgia railroad in March, 1941. From February to July, 1919, Mr. Walsh was valuation engineer of the Atlantic Coast Line, and from July 1919 to March 1920, engaged in valuation work for the Atlanta & West Point, the Western of Alabama and the Georgia. He was appointed superintendent motive power of the latter roads in March, 1920.

PETER JOSEPH JOHNSON, district master mechanic of the Canadian Pacific at Montreal, Que., has been appointed assistant superintendent motive power of the Eastern lines of the Canadian Pacific, with headquarters at Toronto, Ont. Mr. Johnson was born at Richmond, Que., on October 19, 1892. He joined the Canadian Pacific in 1906 in the car department at White River, Ont. He became shop foreman in 1918, serving at Chapleau, Ont., Angus, Que.; Schreiber, Ont. Winnipeg, Man.; and Brownville Junction, Me. In 1930

Peter Joseph Johnson

he was appointed general foreman and served successively at McAdam, N. B.; Ottawa, Ont.; Farnham, Que.; Toronto; and North Bay, Ont. He was appointed division master mechanic of the Trenton division in 1932 and subsequently was transferred to London, Ont., Farnham, and the Montreal terminals. Mr. Johnson was appointed district master mechanic of the Quebec district at Montreal on October 1 1945.

J. V. B. DUER, assistant to vice-president—operation of the Pennsylvania, with headquarters at Philadelphia, Pa., has retired after 41 years of railroad service. Throughout his career Mr. Duer has been closely associated with the various electri-

Good News for Travelers

that Good Brakes help to write

Next to a top safety record, railroad men are generally proudest of a blue-ribbon record for maintaining schedules. The "On Time" chalked on the announcement board is a big factor in winning passenger patronage and building good will.

Westinghouse HSC electro-pneumatic air brake equipment helps many famous trains to build reputations for dependability. In application and release, the impulse travels the length of the train in the wink of an eye. Braking pressures are equalized automatically on all cars in the train.

The engineman can make a later application in approaching restricted speed zones, and a quicker release in leaving. Running time can be substantially reduced without increasing top speed.

For your modern passenger trains, use this modern combination: HSC AIR BRAKES . . . for braking flexibility to match modern train speeds, and unequalled smooth action. SPEED GOVERNOR CONTROL . . . for regulating brake forces to wheel speeds. AP DECELOSTAT . . . for wheel slip detection to keep the wheels rolling.

Brakes are Basic to Railroad Progress

Westinghouse Air Brake Co.

WILMERDING, PA.

Bakes or Dries
Coils & Armatures
Automatically
NO Watching • NO Timing

- Hi-volume horizontal air flow.
- Automatic heat control.
- Positive fresh air intake.
- Controlled volatile exhaust.
- Uniform temperature.
- Economical to operate.
- Easy to load and unload.

HERE'S AN OVEN that saves time on urgent motor repair jobs. This DESPATCH S Oven reduces baking time 25 to 35%, and bakes *automatically*—without watching or timing!

Average load for this 6'x6'x6' oven is 72 armatures and 100 complete coil sets. Daily capacity is 216 armatures, 300 complete coils. Temperature: 300°F. to 450°F. Time: variable up to 6 hours—ave. 4 hours at 300°F. Direct gas fired convection heat . . . automatic, safe (Factory Mutual approved).

GREAT NORTHERN Shops, St. Paul, bakes two 3-ton 36" diameter armatures for diesel-electrics in 12 hours with this DESPATCH Oven.

DESPATCH OVEN COMPANY
Minneapolis Office: 619 S.E. 8th St.
Chicago Office: 221 N. LaSalle St.
Offices in All Principal Cities

DESPATCH OVEN COMPANY

WRITE TODAY for information

ROUSTABOUT CRANES

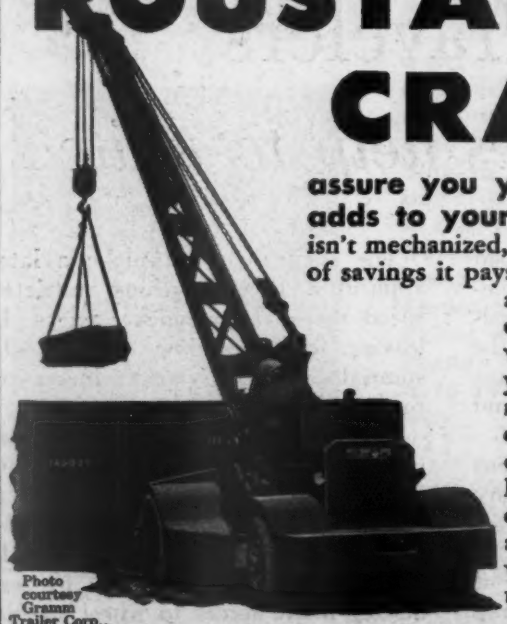


Photo courtesy Gramm Trailer Corp., Delphos, O.

assure you yard efficiency that adds to your profits. If your yard isn't mechanized, it's probably a gold mine of savings it pays you to dig into. Winter and summer, indoors but especially out, rugged, versatile Roustabouts save you time, manpower and money — prevent costly delays and expensive handling. Hook or magnet loads to 7½ tons—modernly engineered for fast action and years of overwork; ask hundreds of users. Write for the facts!

THE HUGHES-KEENAN COMPANY
606 NEWMAN STREET . . . MANSFIELD, OHIO

ROUSTABOUT CRANE

Roustabout Cranes
By Hughes-Keenan
Load-Handling Specialists Since 1904

fication projects of the Pennsylvania system. He played a prominent part in supervising the electrification of the railroad's eastern seaboard lines between New York, Philadelphia, Pa.; Baltimore, Md.; Washington, D. C., and Harrisburg, Pa., his work in this connection involving not only roadway construction but also design and construction of the electric locomotives. Mr. Duer was born at Poultney, Vt., in 1882, and was graduated from the Stevens Institute of Technology in 1903 with the degree of mechanical engineer. He thereupon entered the apprenticeship course of the General Electric Company at Lynn, Mass., and Schenectady, N. Y., where he specialized in railway work. In 1905, while the electrification of the Long Island was under way, he entered the employ of the engineering firm which was supervising the project, serving as inspector. The following year, Mr. Duer transferred to the railroad's service in a similar capacity. In 1910, he was appointed a foreman of motormen by the Pennsylvania in connection with the preparation for, and inauguration of, the road's passenger service into Pennsylvania Station, New York, via the Hudson River tubes. Three years later, Mr. Duer was promoted to assistant engineer in charge of electrical work under the mechanical engineer of the Pennsylvania lines east of Pittsburgh, Pa. In 1919 he was appointed electrical engineer for the eastern lines. In 1920 he became a member of the staff of the chief of motive power, with the same title, and his duties were extended to cover the entire system. In 1935 he was appointed chief electrical engineer and in 1941 assistant to vice-president—operation.

ARTHUR E. RICE, whose appointment as chief mechanical officer of the Denver & Rio Grande Western, with headquarters at Denver, Colo., was reported in the July issue, was born at Denver on October 7, 1889. He entered the service of the D. & R. G. W. on June 10, 1907, as a machinist apprentice at Denver; became a machinist in 1912; a gang foreman in 1918; a general erecting foeman on January 1, 1919, and an assistant mechanical inspector on June 1, 1919. Mr. Rice was appointed general foreman at Pueblo, Colo., on August 7, 1919;

Arthur E. Rice

acting master mechanic at Pueblo on September 12, 1922, and master mechanic at Salida, Colo., on January 15, 1923. Six

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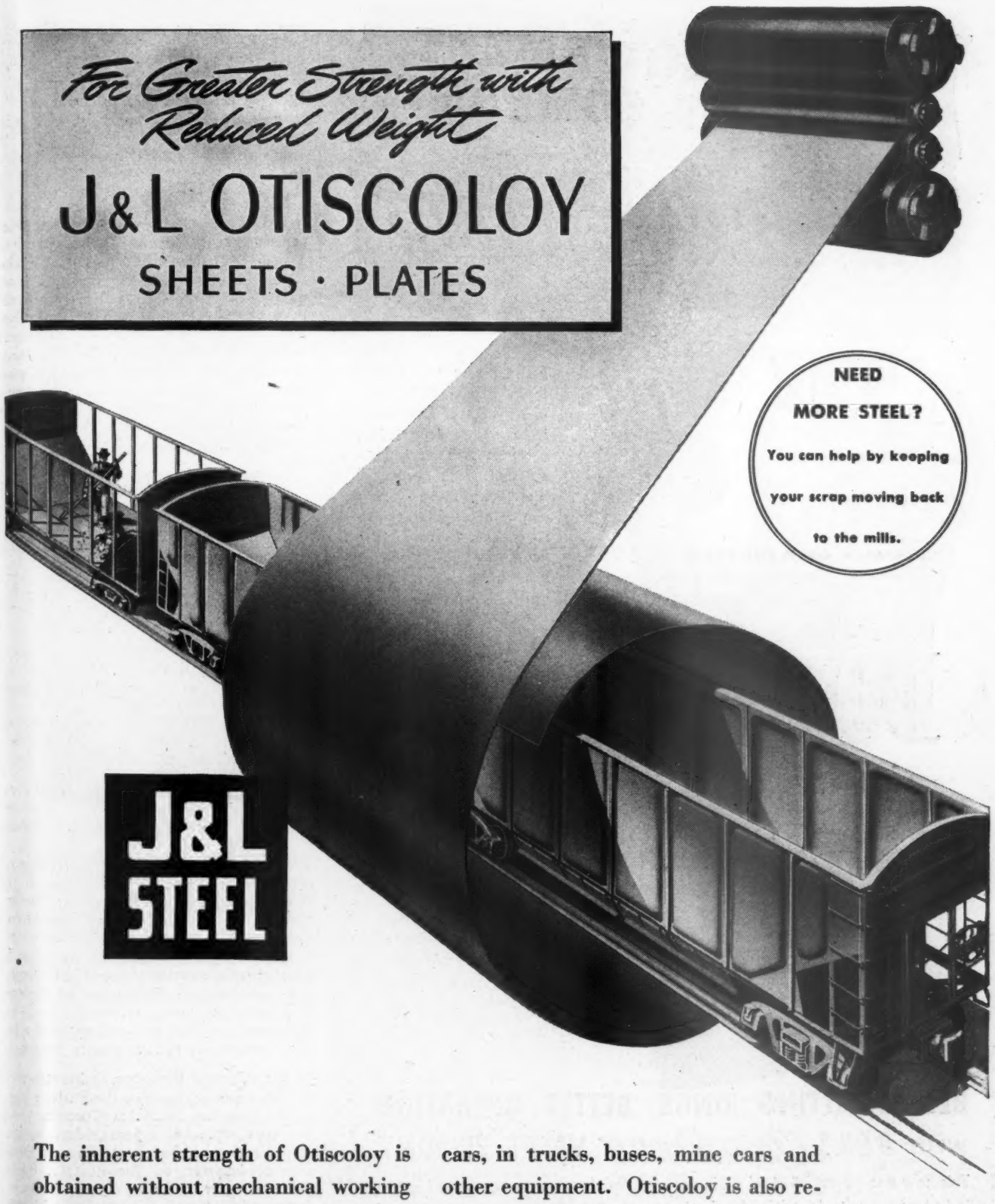

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months later he was appointed general mechanical inspector at Salt Lake City, Utah, and in October, 1923, he returned to Salida as general foreman. On June 1, 1926, he became master mechanic at Alamosa, Colo.; on September 10, 1928, master mechanic at Denver; on April 16, 1942, assistant superintendent at Pueblo, and on October 1, 1942, assistant to the chief mechanical officer at Denver.

JOHN L. ROACH, who has been appointed superintendent of motive power of the Fort Worth & Denver City (part of the Chicago, Burlington & Quincy), with headquarters at Childress, Tex., as announced in the July issue, was born at Greencastle, Ind., on November 25, 1874. He entered railroad service in 1889 as an enginehouse laborer on the Missouri Pacific at Kansas City, Kan.; later served as a machinist apprentice, and became a journeyman machinist in 1895. In 1900 he became a machinist in the employ of the Atchinson,

John L. Roach

Topeka & Santa Fe; in 1901, as shop foreman; and in 1904 machine foreman of the Denver & Rio Grande Western at Pueblo, Colo. In 1905 Mr. Roach joined the Colorado & Southern (part of the C. B. & Q.), at Denver, Colo., and served as a machinist and assistant enginehouse foreman until March, 1907, when he became shop foreman of the F. W. & D. C., at Childress. In 1908 he was appointed general foreman and in 1910 master mechanic.

OWEN RUPERT BAREFOOT, assistant superintendent motive power of the Eastern lines of the Canadian Pacific at Toronto, Ont., has been appointed superintendent motive power and car department, Eastern lines, with headquarters at Toronto. Mr. Barefoot was born at High Wycombe, Buckinghamshire, England, and was educated in the public and high schools of Montreal, Que. He entered railroad service in 1909 as a machinist apprentice in the Angus shops of the Canadian Pacific. During World War I, he saw active service overseas with the 60th battalion from July, 1915, to April, 1919. Mr. Barefoot became mechanical draftsman of the Canadian Pacific at Montreal in June, 1919; machine shop foreman at North Bay, Ont., in August, 1927; and night locomotive foreman, in August, 1928, serving successively at North Bay, Lambton, and Toronto. In June, 1936, he was appointed division master

mechanic of the Schreiber division; general foreman at McAdam Junction in April, 1928; division master mechanic of the Bruce division in November, 1939; acting

Owen Rupert Barefoot

master mechanic of the Algoma district in February, 1942; division master mechanic at Toronto in August, 1942, and assistant superintendent motive power at Toronto on September 1, 1945.

L. H. RICE has been appointed general supervisor Diesel locomotive maintenance of the New York Central System, with headquarters at New York.

JOSEPH W. KING has been appointed foreman Diesel locomotives (night) of the Southern at Alexandria, Va.

SAMUEL E. BUTLER has been appointed foreman Diesel locomotives (day) of the Southern at Alexandria, Va.

MADISON H. BARNETT, general enginehouse foreman (Diesel maintenance) of the Southern at Chattanooga, Tenn., has been appointed general Diesel supervisor at Chattanooga.

A. R. SNYDER, superintendent of motive power and machinery of the Union Pacific at Cheyenne, Wyo., has been appointed to the newly created position of mechanical superintendent of Diesel power, with headquarters at Omaha, Neb.

C. L. HALL has been appointed general supervisor Diesel locomotive maintenance of the New York Central System, with headquarters at New York. The position of assistant supervisor Diesel locomotive maintenance have been abolished.

W. W. BATES, assistant to the superintendent of motive power of the Chicago, Milwaukee, St. Paul & Pacific at Milwaukee, Wis., has been appointed assistant superintendent of motive power in charge of Diesel operation, with headquarters at Milwaukee.

W. C. MARSHALL, assistant superintendent of motive power in charge of Diesel operation, of the Chicago, Milwaukee, St. Paul & Pacific at Milwaukee, Wis., has been relieved of these duties at his own request. Mr. Marshall becomes assistant to the superintendent of motive power at Milwaukee.

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Master Mechanics and Road Foremen

M. W. McMAHON, assistant superintendent shops of the Cleveland, Cincinnati, Chicago & St. Louis at Beech Grove, Ind., has been appointed assistant master mechanic of the New York Central at Buffalo, N. Y.

W. J. SUBER, assistant master mechanic of the Seaboard Air Line at Americus, Ga., has been appointed master mechanic of the Alabama division, with headquarters at Americus.

R. BAILEY has been appointed division master mechanic of the Canadian Pacific at Montreal, Que.

W. C. WARDWELL, master mechanic of the New York Central at Buffalo, N. Y., has been transferred to Albany, N. Y.

F. L. HOFFMAN, assistant master mechanic of the New York Central at Buffalo, N. Y., has been appointed master mechanic, with headquarters at Buffalo.

CHESTER B. EIFORD has been appointed road foreman of engines of the Southern, with headquarters at Birmingham, Ala.

A. E. EDWARDS has been appointed master mechanic of the Atlanta & West Point and the Western of Alabama, with headquarters at Montgomery, Ala.

A. HAYWARD, master mechanic of the Canadian Pacific at Lethbridge, Alta., has been transferred to Vancouver, B. C.

L. N. WINSLADE, division master mechanic of the Canadian Pacific at Montreal, Que., has been appointed district master mechanic, with headquarters at Montreal. Mr. Winslade was born on July 24, 1906. He became a call boy in the locomotive department of the Canadian Pacific at London,

L. N. Winslade

Ont., in 1922. In 1930 he was promoted to locomotive foreman and served successively at Angus, Que.; Guelph, Ont., Goderich, Windsor, and Lambton. On October 1, 1945, he was appointed division master mechanic, Toronto and Montreal Terminals.

H. E. AENCHBACHER, who has been appointed master mechanic of the Seaboard Air Line at Savannah, Ga., as noted in the June issue, was born on December 11, 1897, at Atlanta, Ga. His career with the Seaboard began on January 10, 1918, as a machinist. He became machine and erect-

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Omaha 5, Nebraska

Electrical

ing shop foreman at Howells, Ga., on November 1, 1938; general foreman locomotive department at Howells on July 1, 1943; assistant master mechanic at Hamlet, N. C., on October 1, 1944, and master mechanic, Carolina Division, with headquarters at Savannah, on May 1, 1947.

J. A. ANDREUCETTI, chief electrical engineer of the Chicago & North Western at Chicago, has retired.

W. H. CHAPMAN, electrical engineer of the Chicago & North Western at Chicago, has been appointed chief electrical engineer, with the same headquarters.

W. BENNETT has been appointed general car foreman of the Chicago, Milwaukee, St. Paul & Pacific, at Galewood, Ill.

ERNEST BUCHHOLTZ, general car foreman of the Chicago, Milwaukee, St. Paul & Pacific at Chicago, has been appointed district general car foreman, with headquarters at Minneapolis Minn.

L. S. KURFESS has been appointed supervisor of car repairs, Western district, of the Erie, with headquarters at Cleveland, Ohio.

T. E. CARROLL, assistant general car foreman of the Union Pacific at Portland, Ore., has been appointed a car maintenance engineer at Omaha, Neb.

J. P. LOWERY has been appointed division car foreman of the Erie, with headquarters at Meadville, Pa.

H. L. HEWING, district general car foreman of the Chicago, Milwaukee, St. Paul & Pacific at Tacoma, Wash., has been transferred to the position of district general car foreman at Chicago.

H. N. JUEL, general car foreman of the Union Pacific at Denver, Colo., has been appointed a car maintenance engineer at Omaha, Neb.

HILLIARD G. HENDON has been appointed foreman car inspectors of the Southern at Forrest shop, Memphis, Tenn.

A. W. ALFREDS, car maintenance engineer at Omaha, Neb., has been appointed to the newly created position of mechanical superintendent of the car department, with headquarters at Omaha.

J. A. SCHROEDER, mechanical engineer of the Union Pacific at Omaha, Neb., has been appointed general foreman of the car department at Denver, Colo.

ERNEST A. MCALOON, foreman coach yard of the Southern at Atlanta, Ga., has been appointed general foreman car repairs at Macon, Ga.

S. C. LUND has been appointed division car foreman, Penhorn car shop, of the Erie, with headquarters at Jersey City, N. J.

L. WOODRUFF ESKEW has been appointed foreman car inspectors at the North Avenue coach yard of the Southern at Atlanta, Ga.

C. E. BARRETT, district general car foreman of the Chicago, Milwaukee, St. Paul & Pacific at Minneapolis, Minn., has been transferred to the position of district car foreman at Tacoma, Wash.

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NO-RUST

● Interior moisture on car sheets caused by condensation makes them easy prey to ravaging rust. As cars are pulled out of service for repairs, operating revenues decline and maintenance costs mount.

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An application of NO-RUST will last indefinitely. It sets to a plastic firmness that will not crack or chip. NO-RUST is applied in a thin coat which greatly reduces the dead weight so apparent in other compounds. Specify NO-RUST whenever rust and corrosion is probable. It cuts costs, increases revenues.

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New NAILABLE STEEL FLOORING

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Even after heavy impact-loading like this, Nailable Steel Flooring retains a surface suitable for all types of freight — finished goods that must be blocked, fine bulk freight requiring a tight surface, rough heavy materials that chew up less durable flooring. The floor remains generally flat throughout its length—provides a good surface for skidded loads.

A special plastic material in the nailing grooves between the channels seals itself when the nails are withdrawn, maintaining a tight floor at all times. Securely welded to the underframe, the channels act as a rigid, horizontal diaphragm and strengthen the entire car.

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Nailable Steel Flooring is cold-formed from tough, corrosion-resistant N-A-X HIGH-TENSILE for high cantilever strength, impact-resistance and wearability. It's flat and smooth—can't be ripped up by unloading tools. Under normal operating conditions it's expected to last as long as the car itself. Cars decked with Nailable Steel Flooring spend less time on the rip tracks and in the shops—save dollars in floor repair and replacement costs.

REDUCES OPERATING COSTS AND DAMAGE CLAIMS, TOO!

Because it handles *all* types of gondola and boxcar freight, Nailable Steel Flooring cuts down switching and assembly operations and empty car movement. Turn-around time is lowered, car supply improved, operating costs reduced!

Nailable Steel Flooring has no splinters or sharp edges to rip sacked goods. Spilled liquids aren't absorbed. Blocking is more secure, because nails are gripped with greater force than in wood—yet can be readily removed with no damage to the floor. All this means more protection to goods in transit—and fewer damage claims!

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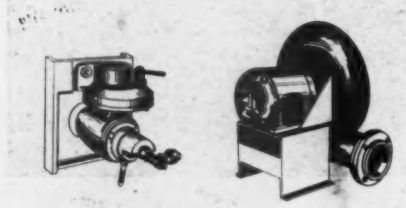

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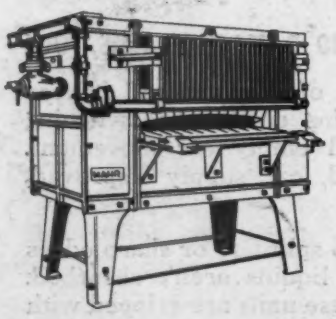

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Shop and Enginehouse

JAMES R. CRESS has been appointed assistant night enginehouse foreman of the Southern at Monroe, Va.

SAMUEL R. BRUCE has been appointed assistant night general foreman of the Soutnern at Spencer, N. C.

C. FRANK SHOAF has been appointed assistant machine shop foreman of the Southern at Spencer, N. C.

SAMUEL M. BRYANT, general foreman of the Southern at Greenville, S. C., has been appointed general foreman at Charlotte, N. C.

WILLIAM C. DAVIS has been appointed assistant night enginehouse foreman of the Southern at Ludlow, Ky.

JOHN H. MILLER has been appointed day enginehouse foreman of the Southern at Spencer, N. C.

G. F. MOORE has been appointed acting night foreman of the Atlantic Coast Line at St. Petersburg, Fla.

JAMES C. WADDLE has been appointed general enginehouse foreman of the Southern at Chattanooga, Tenn.

AUGUST J. BROCKMANN, assistant enginehouse foreman of the Southern at Monroe, Va., has been appointed general foreman at Danville, Va.

MELVIN V. RALEY has been appointed foreman boilermakers of the Southern at Meridian, Miss.

HENRY E. STEPHENS has been appointed assistant day enginehouse foreman of the Southern at Birmingham, Ala.

VERNON R. COWARD has been appointed night enginehouse foreman of the Southern at Monroe, Va.

CLAUDE S. BRIDGES has been appointed assistant enginehouse foreman of the Southern at Inman enginehouse, Atlanta, Ga.

ADGER L. GANTT, general foreman of the Southern at Charlotte, N. C., has been appointed general foreman at Lynchburg, Va.

R. W. DANIEL, master mechanic of the Chicago, Indianapolis & Louisville at LaFayette, Ind., has been appointed general shops supervisor, with headquarters at LaFayette.

AUBREY M. CARY, general foreman of the Southern at Danville, Va., has been appointed general foreman at Winston-Salem, N. C.

Obituary

BYRON J. PEASLEY, who retired in January as superintendent of motive power of the St. Louis Southwestern, with headquarters at Tyler, Tex., died in that city on July 6. A photograph of Mr. Peasley and a sketch of his career appeared in the March issue at the time of his retirement.

H. E. GILLETTE, supervisor of production and machinery of the Chicago, Burlington & Quincy, at Chicago, died at Aurora, Ill., on July 11.

Complete HEAT COVERAGE for the Hard-to-Heat Railway Shop

The ideal heating system for the notoriously hard-to-heat railway shop is an installation of Wing Revolving Unit Heaters. The Wing Revolving Unit Heater is unique in that it does what no other heater can do—its slowly revolving outlet gently distributes the heat continuously in a constantly changing direction. It reaches over, around and under obstructions into far away corners and repair pits, its moving streams of heated air spreading an even, uniform, healthfully invigorating blanket of warmth over the entire working area.

Wing
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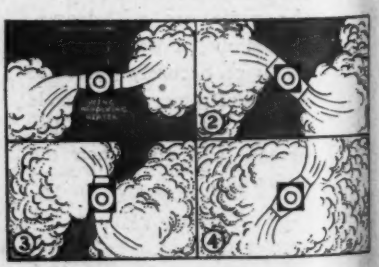
UNIT HEATERS



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Wing Revolving Unit Heaters keep the heated air moving in a constantly changing direction. Its properly warmed, healthful air currents thoroughly distributed, create a sensation of live, invigorating comfort for the workers.

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